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THE
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THE HYGIENE OF SLEEP

By WILLIAM H. BURNHAM

It is a remarkable thing that we know little about the most fundamental processes in our daily life,—activities vital and essential to our health and happiness. Particularly is this true of the phenomenon of sleep. All sorts of theories have prevailed in regard to it; some of them absurd; some of the recent ones extremely illuminating.

If we look at the whole matter objectively, as we might imagine a being doing in some other planet where sleep is unnecessary, if we take such an objective view, we may naturally ask, is this a stupid habit into which the human race has fallen, just as some animals indulge in a hibernal sleep from lack of stimulation, or is it an essential condition for health and normal activity? The answer to this question is simple, and has been given definitely and concretely, not only by the observation of the race, but by recent investigations that have shown poisonous products present in the nervous system under conditions of prolonged wakefulness.

If one should speak of a condition in which the temperature of the body is decreased, the pulse and respiration retarded, the eyeballs rolled upward, the pupils small, fatigue and relaxation of the muscles apparent, the eyelids heavy, consciousness obscured or lost as in narcosis,—then it would seem, as one writer has suggested, as if one were trying to describe a morbid condition, as appears in some cases of acute poisoning; and yet, it is a physiological condition; namely, sleep. The poet is not far wrong in calling sleep the image of death.

The poet, however, is apt to see only the superficial features of physiological processes, however acute may be his insight for the higher transcendental realities. The physiologists have hardly done much better.

All the theories of sleep reviewed by Foster(10) and Claparède,(8) with the exception of two or three dynamic hypotheses, have one thing in common, they regard sleep not as a function but rather as the cessation of the functioning of the organism, with the exception of nutrition. It is largely a negative, passive state. And Maudsley even treats the subject in his "Pathology of the Mind," not in his book on "Mental Physiology." Sleep, according to these old theories is a form of anaemia, a depression or compression of the brain, an asphyxia, an intoxication, or the like. This negative doctrine of sleep has been formulated by Bertin. "Sleep," he says, "is nothing unless it is the cessation of the special functioning of the brain . . . sleep is then a negative condition of the nervous system. It represents the cessation of the special activity of this mechanism" This idea is still prevalent in contemporary physiology.

As the most fundamental characteristic of the organism is response to stimulation, either internal or external, it would be strange if for a third of the life of the individual that fundamental characteristic were to be inhibited or abolished; and yet a large part of the theories of sleep represent it as a kind of negative condition, characterized by the cessation of function. What can be said from our present point of view for a different theory of sleep, that makes it not the cessation of function but an active function itself, a form of response to stimulation? Let us consider this subject from the point of view of stimulation and response, and determine if we can the normal stimuli on the one hand, and the normal response on the other. A theory that has become prominent in recent years is distinctly in harmony with this point of view, namely, the theory of Claparède,(8) according to which sleep is an instinctive reaction to certain stimuli.

This theory does not conflict with the facts upon which most other theories are based. Thus during sleep there is anaemia of the brain. There is apparently an accumulation of toxic products; there may be a diminution of the store of oxygen in the nerve cells; there may be shrinkage of the nuclei and a change in the character of the cell protoplasm, as found by Dr. Hodge in the case of animals as a result of the day's work. There may also be changes in the circulation of the blood, or inhibition of the nervous activity, or any one of a number of other physiological conditions; but all of these are, according to Claparède, concomitants of the condition that we call sleep, not causes.

According to Claparède, sleep is a positive function of the nervous system. It is a means of protection, of defense. We do not sleep because we are exhausted, but we sleep to prevent being exhausted. We do not sleep because of auto-intoxication, but to prevent this. He cites the well known fact that sleep and fatigue are by no means parallel, but often fatigue prevents sleep. Many facts also indicate that sleep is similar to the instinctive reactions. In sleep we conform to the universal law of instinct, that of following the momentary, immediate interest; and the reaction of sleep may be produced like other instinctive actions either by external or internal stimuli.

To give Claparède's theory in his own words: "Sleep is not a purely negative, passive condition; it is not the result of a simple arrest of function; it is a positive function, an action of the reflex kind, an instinct, which has for its end this arrest of function. It is not because we are intoxicated or exhausted that we sleep, but we sleep in order not to become so."

As we see in the case of the different instincts, the essential thing is the reaction of the organism to stimuli. Now, if we take the case where the stimuli in a situation are monotonous as, for example, in a dark and quiet room, or where we listen to one sound, as the falling of water, the rhythmic action of monotonous music or the like, what is the form of reaction? Observation and experiment have shown that usually the reaction in such situations is sleep or some related condition, hypnosis, or the condition preliminary to hypnosis, called by some the hypnoidal state. In other words, sleep is a reaction of the nervous system to stimuli which impinge upon it, it is a positive reaction like any other instinctive reaction, but unique in its character.

The difficulty in accepting this view for the most part disappears when we remember that the stimuli which bring about instinctive reactions may be either internal or external. In the case of sleep both are active. The primary stimulus of sleep is the sensation of fatigue. The secondary stimuli are darkness, or light, the sight of familiar objects, monotonous sounds, and the like.

The reflexes, Claparède points out, the cardiac, the respiratory, the pupillar reflex of the eye, etc., are partial reactions of the organism. The mechanism of the reflex is rigid, prompt, inevitable, and usually outside of the control of the will. The mechanism of instinct, on the other hand, is more elastic, and modified more or less according to the surrounding circumstances. Instinct is an all round reaction, a true reaction of the whole being, monopolizing all the motility and all the attention of the individual. It is reaction to the whole situation, and it can be instantaneously modified according to circumstance if it is for the interest of the animal to turn his activity suddenly in another direction. Thus it results, that at each moment it is an instinct, and naturally the instinct most adequate to actual circumstances, to the situation, which alone dominates the animal's activity. This is the one fundamental law of vital behavior, which deserves to be called law of the supremacy of the instinct momentarily most important, and which Claparède formulates as follows: "At each instant the organism acts along the line of its greatest interest."

The mechanism of sleep, according to Claparède, is as follows: many examples show that sleep only comes and only persists and is only complete in so far as the interest of the subject for external surroundings is less intense than the instinct of sleep; that is, sleep is opposed to interest in surrounding objects. It is a phenomenon of lack of interest in the external world. It is indifference to the present situation; it is a kind of psychological suicide. The being that sleeps renounces *ipso facto* perception of the external world and to a certain degree life; sleep is momentary abdication. Psychological analysis leads to a similar conclusion. Thus Bergson says, 'to sleep is to give up interest. One sleeps in the exact measure in which one gives up his interest.'

The law of momentary interest accounts for the plasticity of sleep. The instinct varies greatly in different individuals; but this is true of instinct in general; and especially with man instinct is modified by habit.

A number of facts seem to be explained more satisfactorily by considering sleep as an active instinctive reaction than in any other way, especially the following. Most of these have been mentioned by Claparède, some have not.

1. There is no direct parallelism between sleep and fatigue. Serious fatigue often makes sleep impossible, or if it occurs it is fitful, not deep and continued. One who is sleepy and rouses himself to continued activity often finds later when he tries to sleep that he cannot. Again, it has often been observed that if children or nervous patients take a nap in the afternoon they sleep all the better the following night.

2. The methods of going to sleep are instructive. Best of all is any device which inhibits the active play of interest. On the other hand, the effort to go to sleep is apt to defeat its own end, and fear of insomnia in pathological cases may be a serious cause of sleeplessness. The way to bring about an instinctive reaction is not to will it but to yield ourselves

to it. In the case in question, it is sometimes more effective to try to keep awake than it is to try to sleep. The stimuli to sleep are also well explained by this theory. They are many and varied. First of all are the sensations of fatigue. Among others, as everybody knows, are darkness, or, in the case of nocturnal animals, light; the sight or representation of the place where one is accustomed to sleep, a couch or bed or the like; a certain attitude, closure of the eyelids; the idea of sleep and the sight of other persons sleeping; the knowledge of the hour, the knowledge perhaps of a certain time for being awakened, etc.

3. The remarkable things many people can do in spite of being asleep. Many persons can go to sleep with full confidence of awakening whenever it is necessary, if the temperature of the room becomes too low or too high, if danger threatens, if a fire alarm should ring, if a neighbor calls for help, or the like.

> "The individual,' says Sidis (20, p. 188), "may be asleep to all else and still be awake to special stimuli whose thresholds are very low. The mother watching over her babe, the nurse and the physician attending their patients, may be sound asleep to loud noises, but are alive and wide awake to the slightest changes in their charges. They have lost touch with the whole external world, but the ones cared for still have a firm hold on them. . . . Let an appreciable change occur in the stimuli to which we are awake, an amount of energy immediately is drawn from the reserve store, the thresholds barring the entrance to the host of intruders are lowered and we are once more in communication with the external world,—our sleep is gone and we are wide awake. *We can thus be wide awake in the very depth of our sleep.* The possibility of shaking off the grip of sleep under appropriate circumstances and especially the highly significant fact of wakefulness in the very depths of sleep form insuperable difficulties for all those plausible, apparently scientific theories of sleep, theories based on circulation, engorgement, anaemia or hyperaemia, narcosis and autointoxication. We can watch in our sleep, count the flow of time and awake at the right moment. The fact that we can sleep and still watch and keep awake in regard to special objects and particular persons shows that sleep is not a matter of blood circulation or of intoxication by accumulation of waste products in the system. Sleep is not a disease, not a pathological process due to the accumulation of toxic products in the brain or in the system generally. Sleep is not of those fatal uncontrollable onsets characteristic of the morbid processes, such as epilepsy, sunstroke, or apoplexy, nor is sleep a sort of narcolepsy."

4. Again the process of waking up has the characteristic of change from one instinctive activity to another. The stimuli which awaken us are excitations which interest us. We awaken at unusual sounds or the like, but do not mind habitual stimuli; just as when awake, if we are occupied with work a great number of sounds may strike our ears

without causing the least disturbance or the least reaction. The fact is, these noises interest us less than our work. It is the same when instead of being occupied with work we are occupied in sleep. With this difference, that sleep is much more absorbing than the most interesting kind of work.

5. A remarkable phenomenon is the power of many persons to awaken at a given hour determined upon when they go to sleep. This can be better explained by this theory than otherwise.

Tschisch and Vaschide(32) have made interesting experiments in regard to the condition of sleep when one attempts to waken at a definite hour fixed upon before going to sleep; and Tschisch found in his own case, from many tests made during three years, that he usually awakened before the time fixed upon, but not more than fifteen minutes before.

Vaschide used a questionnaire with some thirty-three subjects and supplemented the results of this by direct observations in two or three cases. His observers had rather a marked ability for waking at or near the time fixed upon; and he found a distinct difference between the sleep under such conditions and when no such attempt was made. The former he calls attentive sleep and the latter, normal sleep.

Vaschide, as the result of his interesting observations and experiments, comes to the following conclusions:

The influence of attention during sleep is incontestable.

Waking in relation to a fixed hour takes place in the great majority of cases before and not after the moment fixed upon.

Sleep during the nights in which the subjects ought to waken themselves at a definite hour—the attentive sleep as we have called it—is different from the sleep of other nights.

The errors are greater when the individual sleeps in the day than at night.

As physical indications of attention were observed with some subjects sensible acceleration of the heart, and at certain moments a sort of agitation about twenty minutes before the moment of waking.

6. The rapidity with which sleep can succeed a phase of waking activity, and the lucidity which follows immediately after waking, are well explained by the hypothesis of instinctive inhibition. Everyone has noticed this. People who pass the night watching with a sick person, in the many times of waking and dropping asleep, furnish illustrations of this. Also the great difference in the sleep when one goes to sleep with the sense of responsibility and when one is free from care, is hard to explain by the theories of intoxication or the like.

7. Sleep can be postponed. It is easy to explain this fact by the theory of instinctive reaction.

The instinct of sleep at a given moment may be the preponderating one, and again the instant following this may yield to some other. For example, when an animal prepares to go to sleep the sudden advent of danger immediately overcomes the desire for sleep. This had notable illustration in the war.

The soldiers, under the great fatigue of continued fighting and marching, often became extremely fatigued, and it is reported they would drop off to sleep whenever there was a chance, but rouse again when attacked by the enemy. The following is one report.

"All my men are very cheery, but very tired," was the report of one general at a most critical time. "Being attacked," he says, "was the only thing that kept them awake. Towards the end of this fighting they had a drunken craving for sleep and slept standing with their heads falling against a parapet, slept sitting hunched in ditches and slept like dead men when they lay in the open ground, but they waked again when the enemy attacked once more, and fought him and killed him, and dozed off again."

8. The reaction of the instinct of sleep, like those of all complex instincts, is more than a simple response to a stimulus. The various actions involved are coördinated. This is well seen in the preliminary preparations made before going to sleep both by animals and man.

9. In plethysmographic experiments Brodmann has observed that at the moment when sleep occurs the brain is the seat of vaso-dilation. Claparède raises the question whether this does not indicate that at this moment the encephalon is the seat of a special activity.

10. The curves of sleep published by different investigators strikingly resemble the curves of work and fatigue, whether muscular or mental, as found by Mosso and Kraepelin. The continued rise of the curve representing the depth of sleep during the first two hours is comparable to the rise of the curve of work under the influence of *Anregung* or excitement.

Again the curves of sleep, notably those published by Michelson and De Sanctis and Neyroz, present a series of oscillations. These oscillations are comparable to the sudden modifications in the curve of work which Kraepelin refers to distractions and to voluntary or instinctive reactions against these distractions, *i.e.*, to the effects of the *Störungsantrieb*. It is as if the organism, sleep being menaced by distractions, made an effort to reinforce the inhibitory process.

If sleep is an instinctive reaction to certain stimuli, then we should expect that at any time when the necessary stimuli are present, and other stimuli excluded, this response would occur. The investigations of Dr. Boris Sidis on animals and children, and the observations of physicians and others, indicate that this is true.

Dr. Sidis (28) has pretty clearly shown that limitation and monotony of stimulation cause sleep. He cites Heubel, who way back in 1877 noted that the cutting off of all external stimulation tends to bring about a languid condition akin to sleep. When attention is relaxed or interest in external impressions gone, drowsiness supervenes; thus prisoners in solitary confinement, unless they find a source of mental activity by getting some external stimulation, have a tendency to sleepiness. By the limitation of voluntary movement a mass of muscular and kinesthetic sensations are kept out of consciousness, and the result is a lowering of mental activity. He notes also that the cutting off of external impressions is of importance in hypnosis, as when the subject is asked to keep very quiet and make his mind a "blank." Where there is a predisposition to states of dissociation the result of limitation is not sleep but hypnosis, with a fall of thresholds.

"The most important and possibly fundamental condition common to sleep and subconscious states in that of *monotony*. In order to fall asleep we must dismiss all our interests, all our thoughts. Similarly, to induce hypnosis we tell the subject to try not to think of anything. We impoverish, we make *monotonous*, his mental life by making him think of 'nothing in particular.'"

Dr. Sidis (28, p. 41), from his experiments both with animals and children, has given very striking examples of sleep as an instinctive reaction to a definite situation where the stimuli are monotonous. The following illustration from the experiments with dogs is representative.

> "Two puppies of about two months old; very lively, excitable, and barking violently. After some struggle each one was wrapped in a cloth so that even the forepaws did not protrude. At first they were greatly excited by the proceeding and proclaimed their indignation by loud yelping. I took my turn with each one separately. The puppy was held down firmly and given no chance to move its body or to struggle with its paws. I also closed the puppy's eyes with my fingers. The puppy struggled and wriggled under my hand, but I held on tightly. Gradually the puppy ceased its struggles and became very quiet. Respirations became slow and regular. I gradually released my grip on the dog, when I found that its eyes were firmly closed. The puppy was fast asleep. The same performance was carried out in the case of the other puppy. After five minutes, during

which time I held the dog tightly and kept all the extremities in close grip, the puppy passed into a quiet state and fell asleep as the first one did. Respiration was slow and uniform. Both puppies slept peacefully. There was no response to external stimuli. Limbs were in a state of relaxation. In spite of the noise in the neighboring room the puppies kept on sleeping."

In the case of young children Dr. Sidis' method of experimentation was similar; especially conducive to sleep were the sensations produced by monotony and the limitation of the coenaesthesia or the bodily sensations, brought about by pressing the abdomen, rocking the body, and the like.

Claparède's theory was formulated before the recent experimental studies of insomnia in dogs by Legendre (17) and Piéron (21). The results of these studies have added to our positive knowledge of sleep, and yet these results are not in conflict with Claparède's view. As Legendre (17, p. 600) himself says, the theory of Claparède "reaches beyond the sphere of pure physiology into that of psychology. Nevertheless, it offers a new field of activity for the physiologist."

These experimenters kept dogs awake for periods varying from 30 to 500 hours and obtained evidence of the presence of a hypnotoxin, not to be found in the blood, but in the brain and cerebro-spinal fluid. Histological examinations of the animals after insomnia showed distinct objective changes in the cortex of the pre-frontal region; the cells were diminished in size, the nuclei displaced and the Nissl granules in a condition of chromotolysis. The serum or the cerebro-spinal fluid of these animals exhausted by loss of sleep was injected into normal animals, and in about half an hour produced an imperative need of sleep. The animal showed the characteristic symptoms, and its brain also presented the characteristic lesion of insomnia. Injections of the cerebro-spinal fluid from a normal animal under similar conditions had no effect whatever.

According to the report of these investigators (17, p. 601), "Even under these conditions prolonged loss of sleep is always very serious, and after about 10 days the animals have generally reached the limit of resistance. During the entire period of this wakefulness the need of sleep becomes more and more imperative, and one can see among the seeming physiological factors of sleep those which tend to increase it and affect the need of sleep and those which do not disturb sleep and consequently can not be considered as its causes. The temperature of the body remains normal, the respiration undergoes no variation, and the amount of carbon dioxide in the blood does not increase, which enables us to exclude the theories of the impoverishment of the blood in oxygen and its enrichment in carbon dioxide as actual causes of sleep. Neither the blood nor the brain lose their portion of water, and this fact combats the theories that explain sleep by dehydration. Toward the tenth day the animal can no longer keep

> its eyes open; its paws are continually bending, it has lost all sensorial activity and only the strongest kind of stimulation will induce reaction. At this moment the brain shows cellular disturbance, localized exclusively in the frontal lobe, such as could not have been brought on by other means, and which, therefore, seems to be characteristic of insomnia. If such an animal is left to sleep at will, he plunges into a deep sleep, from which he awakens completely refreshed, normal, and the alterations in the brain have then disappeared."

Legendre in his investigations raised the problem, suggested by Claparède, what is sleep a protection from, and attempts to answer this from the results of his experiments. Without attempting to solve the problems involved, Legendre answers this question by the conclusion that in general the protection is from poisoning by the hypnotoxin produced in the brain during a prolonged period of waking.

Claparède's theory covers all the different forms of sleep and related conditions; and the modifiability of instinct enables us to understand the variations of sleep and the causes of drowsiness, awakening, and the like.

Shepard (27, p. 77), in his excellent study of circulation and sleep, comes to a conclusion substantially in harmony with that of Claparède and maintains that sleep is a mental process controlled by conditions similar to the conditions of attention. He says:

"The oncoming of sleep may be greatly influenced by one's surroundings. This does not always mean that sleep is promoted by withdrawing from external stimuli; one who is accustomed to sleep much under the influence of certain external stimuli may demand their presence. Sleep is promoted by the situation in which we have really become accustomed to sleep. One may learn to sleep best in a given environment, just as one may learn to give attention to anything, or to work best in a given environment. One may even learn to sleep in a position which requires the continued contraction of a certain set of muscles in order to maintain his balance. It may be more difficult to wake up than to keep awake sometimes, just as it is difficult to shift attention when it is once absorbed in a subject. Sleep is controlled by conditions similar to those which control attention generally. Sleep and sleeplessness are mental processes."

Claparède's theory of sleep is not demonstrated. It is, however, based upon facts and in harmony with our general biological knowledge. This theory is at least a good working hypothesis. As we have seen, it does not conflict with any of the physiological facts that have been established; anaemia of the brain, accumulation of toxic products during the day, the loss of irritability in the nervous system, and so on, are all conditions, not causes of sleep. It is noteworthy that some of the most important recent studies of sleep, by Legendre, Sidis, Shepard, and others, are in large part in accord with Claparède's theory.

The recent theories of the conditions of sleep, especially those of Kronthal (15) and Verworn (33) do not, it seems, necessarily conflict at all with the views of Claparède. In fact so far as Claparède holds that sleep is due to lack of interest these theories are distinctly in harmony with this view; and they throw light on the cause of this lack of interest.

In the words of these writers the imperative need of sleep is a result, not of exhaustion, but of cerebral fatigue, making the distinction established by Verworn. The normal destruction of toxic products is brought about by a process of oxidation during sleep. This process of oxidation goes on less rapidly during waking hours, and a dangerous accumulation occurs which is fatal to the life of the individual if the waking state is too greatly prolonged, as shown by experiments of Agostini and of Daddi.

Thus it is true that all our life-activity involves processes of metabolism and the formation and accumulation of toxic products. When these toxins accumulate in sufficient quantity to become dangerous the organism naturally protects itself against the poison. This it does par excellence by a period of sleep when the breaking down of tissue is reduced to a minimum and the processes of assimilation predominate over those of dissimilation.

According to Claparède the idea of life does not involve any idea of repose or of sleep. These are phenomena contingent to activity not necessary to it. Life implies nutrition, it does not imply at all the phenomenon of sleep. The state of sleep as a restorative would affect the activity of the organism only in the following cases: First, if the organism expends more rapidly than it acquires. Second, if the toxic products of organic combustion are eliminated less rapidly than they are formed.

One can easily conceive of organisms in which the building up processes exactly compensate for the expenditure, and in which the toxic products are eliminated in a degree corresponding to their formation. Here, sleep would not be implied in the idea of life. In fact, it would not appear to be an advantage. Inferior organisms, such as the microbe, it is maintained, do not sleep. According to the study made by Hodge and Aikins (12), the protozoa do not sleep. At least they found that the vorticellae worked incessantly during a period of 21 hours. These animals never sleep.

"With food in abundance," say the writers, "capable of yielding a continuous supply of energy, it is a strange physiological paradox that all animals should not be able to work continuously. For any of the higher animals, at least, this is not possible. . . . It seems only reasonable, however, that protoplasm may be formed as fast as used under favorable conditions of nutrition, and that with equally good facilities for the removal of decomposition products, these may not accumulate in amounts sufficient to interfere with activity. So far as we are able to interpret the significance of our own experiments, this is the state of things in a Vorticella under favorable conditions of life."

Animals need, in the struggle for existence, the power of intense activity, and hence they become exhausted. On account of the law of momentary interest it is necessary that repose should precede exhaustion. Animals which have slept before becoming completely exhausted have thus had an advantage in the struggle for existence and have been preserved by selection. Most animals having reasons for being active in the daytime, it is not surprising that they have been fatigued at night and have slept. Those which have been obliged for other reasons to be active at night have been fatigued in the morning and slept during the day.

One other theory, that of Stekel(30), although somewhat fantastic, is interesting and suggests the possible importance of the will, at least, in controlling the stimuli that tend to produce sleep. He goes much farther than Claparède and would make the reaction of sleep a voluntary reaction.

According to Stekel's theory, man sleeps because he wishes to sleep. Former theories have said man sleeps because he must sleep, he is forced to sleep. On the contrary he maintains that man forces himself to sleep. Sleep is a kind of autohypnosis. Excitement, feeling, is the stimulus that keeps one awake, and when the stimuli of the day are dulled, and interest in daily activities wanes, and in all cases when the individual becomes bored or blasé, the tendency is to sleep. For this he gives a fantastic reason, namely, that the unconscious, that limbo of primitive desires and passions and impulses, is more attractive to the individual than waking life. The unconscious is more exciting than the conscious. Thus, the more consciousness is developed, as in intellectual men and men of genius, the less one sleeps; and the less interesting consciousness is, the more one desires to drop back into the unconscious and sleep.

According to Stekel, attention and interest are the determining factors. Boredom, lack of excitement, lack of interest in conscious life, are the conditions which bring about sleep, in which dreams always occur and in which the allurement of the unconscious is the dominant factor. This is why men of genius sleep little, because consciousness to them is exciting.

Thus to Dr. Stekel the will to sleep is a powerful hypnotic, and if the conditions are favorable, if the necessary stimuli are present, the response of sleep is likely to be continuous if the will to sleep is present.

None of the theories are adequate. The theory of Claparède is perhaps the most satisfactory. The essential of it is that sleep is a positive nervous function, an instinctive reaction of defence.

As Claparède sums up the matter, this new conception of sleep permits us easily to take account of all the facts which form insuperable obstacles to the passive theories of sleep, the chemical, toxic, and the like: lack of parallelism between sleep and exhaustion, the periodic character of sleep, the possible arrest of sleep by interest or volition, suggestion of sleep, partial sleep, the character of the curve of sleep, variety of types of sleep in animals and so on. This conception permits us still further to look upon the hibernal or aesteval sleep as a parallel of sleep descended in a direct line from ordinary sleep and a phenomenon of secondary adaptation.

As to the mechanism of sleep, it consists in a reaction of lack of interest for the present situation. It is not, as is usually believed, the irritability, the receptivity, which is weakened or abolished in sleep, but it is the reactivity, notably the reactivity of interest and of adaptation. The psychology of dreams justifies this way of looking at the matter.

To understand this theory of sleep as an instinctive reaction one should keep in mind three things: (1) That all of the time, even during sleep the organism is reacting to stimuli of various kinds. (2) That the stimuli to which sleep is the instinctive reaction are of two kinds, internal stimuli, feelings of fatigue and the like; and second, external stimuli, darkness, the sight of a special location, a couch, perhaps, and so on. (3) In a situation which produces sleep, the external stimuli are reduced to a minimum and usually are monotonous in character, while the internal stimuli remain active.

A few recent investigations concern a number of points that should be considered to make clearer this view of sleep as a reaction to stimuli. Without any attempt to give the results fully, the different points may be presented roughly as follows:

(1) First is the case of hibernal sleep. According to Clapparède this is a response to stimulation. The animals that

fall into lethargy during a certain period of the year are those whose habitual nourishment is lacking at that time. The hibernal sleep is thus regulated by the law of momentary interest. No food is present to keep up their interest in eating. And in other ways this law of momentary interest is shown. It is similar to daily sleep; it is the result of a habit acquired by animals of passing the winter in a cave where they had stored their food.

Many factors probably act as stimuli, among these the following: perception of the lack of food, a low temperature, humidity or dryness, perhaps certain odors peculiar to the season of the year which escape our olfactive sense. Finally, as in the case of instinct in general, internal factors coöperate. The animal goes to sleep when he feels ready for this function. Horvath tried in vain to put his squirrels to sleep in the summer time. It is probable that this readiness for hibernation is principally due to the animal's condition of nutrition. Forel's dormouse was very fat at the time when he went to sleep. Recent studies by Cushing and others show changes in the pituitary gland.

Finally the hibernal sleep is not a simple act but a total reaction of the organism involving a series of coördinated activities. The animal seeks for a cave or shelter. It prepares its bed, curls up in the proper position, and so on. The animal in captivity makes this necessary prelude to sleep. The biological significance of this act is evident. It is an instinct of preservation.

According to Claparède the hibernal sleep of animals and ordinary sleep are similar in character. Some writers have said that hibernation has nothing to do with natural sleep; but in his theory of the positive nature of sleep Claparède finds the bridge between these two classes of phenomena. Dubois has also attempted to show the correspondence between the two; but according to him both are alike in being examples of auto-narcosis. According to Claparède, on the other hand, they are similar because both are instinctive activities.

A large number of observations have shown that hibernal sleep is an instinct. Certain animals like the tanrec of Madagascar fall into lethargy during the dry season and awaken as soon as the rain comes. Others like the dormouse sleep in the summer in the torrid zone and in the winter in the temperate zone.

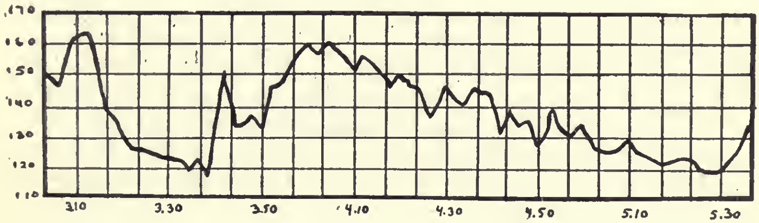
It is obvious, argues Claparède, that the hibernal sleep is not a passive and contingent phenomenon, but on the contrary it is adapted to a specific end. The animals which fall into lethargy during a certain period of the year are those whose habitual food is lacking during that period. The hibernal sleep thus has for its end to hinder certain animals from expending their forces at a time of the year when, for lack of food, they cannot repair them. This sleep has the same biological reason as the migration of birds to escape starvation. It is an act of the whole organism manifesting a certain elasticity since it can be postponed several months according to surrounding circumstances.

(2) The experimental evidence shows that men and animals fall asleep when placed in certain situations; that is, subjected to certain groups of stimuli. More concretely when a child or an animal is put in a dark room and the stimuli are reduced to a monotonous sequence, by wrapping the dog or child in a blanket, for example, sleep occurs. The response of going to sleep here also is to a group of stimuli internal like the sensations of fatigue from the monotonously repeated sound or what not, the reduction in the metabolism, perhaps, and similar conditions, and external stimuli, darkness, a monotonous environment, and the like.

In any case, the reduction of the external stimuli, the presence of certain stimuli that suggest sleep or are conditioned stimuli for sleep and the continuance of certain internal stimuli, are the essential conditions.

(3) In sleep the stimuli are reduced, but by no means excluded. As already noted, the organism is continuously responding to stimuli of various kinds, as has been amply shown by recent investigations.

Again the experiments on the sleep of children give evidence that the condition of sleep itself is one of continued response to stimulation. Not merely do the fundamental physiological processes, the heart beat, respiration and digestion continue, but the metabolism is by no means constant and unvarying; on the contrary it is subject to many and wide variations, as shown in Benedict's experiments, with the kymograph. Of the many cases reported in Benedict and Talbot's excellent study (2, p. 119) one example of the variation in the pulse is presented in the figure below.



The authors compare the pulse record and the kymograph record as follows:

> "The kymograph record shows that after a period of activity from 3h 3m p. m. to about 3h 16m p. m. there was a short period of comparative quiet, *i.e.*, from 3h 16m p. m. to 3h 36m p. m., and that the last period from 5h 07m p. m. to 5h 31m p. m. was also sufficiently quiet to be characterized as activity III. The remainder of the time the infant was quite active, so that experimental observations of the minimum metabolism were impossible. A close examination of the kymograph and pulse curves shows that there is a striking parallelism between them. Thus, from 3h 03m p. m. to about 3h 16m p. m., the infant was restless, with a high pulse-rate, while between 3h 16m p. m. and 3h 36m p. m. the activity was at a minimum and the pulse-rate was low. About 3h 39m p. m. the pulse-rate again rose, the rise being accompanied by increased external activity. This reached a maximum about 4 o'clock and a period of decreasing activity followed until the infant became quiet at about 5h 7m p. m. From that time until it waked up, just before the end of the observation, the infant was quiet with a minimum pulse-rate. Thus we see complete uniformity in both curves."

(4) The whole matter of response to stimulation in sleep is extremely complex. We should keep in mind that there are many stimuli and some may be excluded while others are definitely active. This in large part accounts for the phenomena of so-called attentive sleep. The relation of sensation to stimulation naturally remains the same whether we are asleep or awake, and the ordinary psychological laws as regards sensation and stimulus hold.

As every psychologist knows, we are conscious of a stimulus only when it reaches a certain intensity called the threshold or limen. Again "the increase of the stimulus necessary to produce a just perceptible difference in the sensation bears a constant ratio to the total stimulus." Activity of the sense organ raises the threshold, i. e., decreases the acuity.

In other words, as Weber showed long ago, there are two limens or thresholds. First a stimulus must have a certain intensity or we feel no sensation. Again when a stimulus is acting which produces a sensation, if we are to have any increase or change in the sensation the stimulus must be increased in proportion to the already existing stimulus. Thus the real actual limen always depends upon the amount of stimulus that is acting. When we go to sleep under conditions of monotony, that is, when stimuli are acting with a certain intensity, we do not note a change of sensation unless the stimulus is increased. Thus as we drop asleep the limens are raised. And so too, as this change in limen may be different for different sensations, being low for one and high for another, we may, as Sidis puts it, be awake for one stimulus and asleep for others.

From these facts in regard to the changing limen for sensations, Dr. Sidis (28 and 29) reasons as follows:

"In the course of the daily activity of the individual the thresholds of sensitivity and of sensori-motor reactions in response to the stimuli of ordinary life rise gradually, the stimuli fall below the threshold of living reactions. The mass of stimuli of the external world constituting the external environment of the individual drops out of the life-cycle of the individual and for the time being ceases to exist for him. *The individual is asleep, asleep for that environment.* In other words the stimuli of the external world by their continuous action have become monotonous, have raised the thresholds and have become excluded from the life existence of the individual who is now deeply asleep for that given environment."

"Should an appreciable variation occur in the environment at about the time when the organism is ready to fall asleep *the external world becomes again a living reality.* The individual becomes alive and wide awake to what is going on around him. If an appreciable change in the total mass or in some stimuli constituting the environment takes place, the individual may be awakened out of his sleep. Should the variation occur in some of the stimuli, their thresholds become lowered and the individual, though asleep in regard to all else, is awake in regard to them. This partial waking state is the soil in which dreams develop most luxuriantly. *We do not dream, when we are asleep, we dream, when we are awake.*"

In general Sidis finds that sleep is not so much due to merely cutting off sensory impressions as to the monotony of sensory impressions, which may in fact be intense and numerous. "It is the invariability of sensory impressions that reduces the organism to the passive state which we experience as sleep."

(5) Are the conditioned stimuli. Whether the usual associated stimuli producing conditioned reflexes persist in sleep, depends on the stage of sleep. Apparently they are entirely abolished in deep sleep.

A remarkable study of sleep has been made in Pavlov's laboratory in connection with the experiments on the conditioned reflex. The results are reported in part as follows:

Rojansky has studied sleep as manifested under the influence of uniform and indifferent stimuli, for example, in the environment in which the animal is to be experimented on. When the dog is placed alone in the room on the table, he gradually falls into a state of drowsiness and then into profound sleep. Another kind of sleep is manifested under the influence of active determined stimuli, which they used as strong conditioned stimuli. Under the influence of such stimuli with all of the dogs, with special rapidity in the case of some of them, the state of hypnotic sleep appears. Finally Woskressensky(20) produced a condition of tranquil sleep.

Careful examination of the details of the experiments on the dog showed that sleep occurred under the following conditions. In experiments made by Mme. Pavlov (20) the experiment was begun when the dog was placed on the table. Without making the dog give attention they applied special conditioned stimuli, nourishment serving as the unconditioned stimulus. In these conditions sleep did not occur. In other experiments the dog was kept for a relatively long time on the table before beginning the experiment. With these uniform conditions of the environment a condition of sleep began to manifest itself. The conditions of this sleep were carefully studied and were very interesting.

When all the preparations, arrangements of the apparatus and so on, had been completed and the experiment began immediately, the animal being subjected to the habitual stimuli, sleep did not occur, but if after the completion of the preparation and the beginning of the experiment a single minute was allowed to elapse, immediately the first stage of sleep occurred. If 10 minutes were allowed to pass after the preparations were completed, a second phase occurred, and thus one could gauge the hypnotic power of the environment and study the course of sleep.

The following results were established: Habitually in these experiments there were two reactions of the animal, on the one hand a secretory reaction, the flow of saliva; on the other hand a motor reaction, when the dog was given food. In other words, there were two reflexes, a motor reflex and a glandular reflex. The following table shows the results (20, p. 1081).

Condition of Dog	Phases of sleep	Reflexes		Observations
		Secretory	Motor	
State of waking	+	+ (1)	+	
	I	—	+	
	II	+	—	
State of sleep	III	—	—	Deep sleep
	II	+	—	
	I	—	+	
State of waking		+	+	

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[1] The sign + designates the presence, and the sign — the absence of the reflex.

These investigators give in substance the following explanation of the results in the table: If we begin the experiment immediately after the preparations for it are completed, the animal keeps awake. The secretory reflex and the motor reflex both occur. Saliva begins to flow when the conditioned stimulus begins to act and the dog takes food when given to him. But if we keep the dog under the influence of the environment about two minutes, that is, if two minutes are allowed to elapse after completing the preparations before beginning the experiment, the first phase of sleep occurs. The secretory reflex disappears, the conditioned stimulus does not act, but the motor reflex does persist. If we give a bigger dose of the hypnotic environment, so to speak, that is, if we leave the animal about 10 minutes after the preparations are completed before beginning the experiment, then a more profound sleep occurs and a different reaction. The saliva is secreted, but the motor reflex is absent. This is the second phase of sleep. Again, if the dog is left for half an hour before the experiment is begun, then complete deep sleep occurs and both reflexes disappear. In waking the animal up, if he is wakened gradually, then similar phases occur in reverse order.

As they formulate their conclusion, these results seem to show that a localization, even a displacement of the condition of sleep over the mass of the cerebral hemispheres occurs, and the hypothesis is suggested that this inhibition of sleep occurs in a definite part of the hemispheres.

(6) If sleep is an instinctive reaction, the question may naturally be asked why, in case of a monotonous environment, and where the stimuli to sleep are continuously present, one should not continue to sleep and not awaken at all except when the need of food or the like required. There is some evidence that this is the fact.

Primitive people often sleep a great deal because they are unoccupied and there is little to fix their attention. A friend tells me he is accustomed to sleep whenever he rides on the steam cars; for, as he says, there is nothing to interest him.

Young children, when properly fed and protected, sleep a large part of the time, as everybody knows. People who have nothing else to do are apt to sleep long hours. The Russian peasants in some sections have been reported by one writer as passing the winter in a condition approximating a state of hibernation. Mr. Louis N. Wilson, who has spent many years in Russia, says that this is largely true. In many districts there is nothing to do, the father of the family crawls up onto the big stove, the warmest place in the room, and stays there all the time except when his wife makes him come down to attend to some necessary work.

Most remarkable are the cases of certain individuals who have slept for long periods of time. The most remarkable case of all is that reported some years ago in the Nouvelle Iconographie de la Salpetrière, Vol. 25, 1912, and cited by Stekel(30).

The case was that of a Swedish girl who slept for 32 years. This remarkable case occurred in the little village of Oknö and excited the whole of Sweden. Born in 1861, in 1876, when about 14 years of age, this girl, Caroline Olson by name, came home one day, complained of toothache and went to bed. She is said not to have left her bed until 32 years later in the year 1908. She awoke only occasionally and is said to have spoken only a very few words during the whole period. Her nourishment consisted of only two glasses of milk a day, and it is said that the function of nutrition was so greatly reduced that her brothers and father maintained that it was altogether arrested. This is not true, but the metabolic processes were greatly reduced. Frequently a physician was called; once she went to the hospital, and after 15 days the disease was diagnosed as hysteria. The father maintained that three or four times during the 32 years he saw her crawling about on the floor, and once in his presence she called out " dear Jesus have pity on me."

The mother cared for her daughter constantly, but died in 1905. The death made some impression on the girl. When the father informed her she began to cry, but afterwards became quiet and went to sleep again. After the mother's death a governess came into the house, who was less lenient toward the patient's hysterical behavior. She suspected that Caroline had gone to the kitchen in her mother's absence and helped herself. The governess took better care of the food and Caroline went hungry, and this perhaps was the motive for her suddenly getting up and taking up the work of life.

On the critical day of reawakening, Caroline was found crawling about on the floor and weeping. She kept always crying out " Where is mamma." When her brothers came home she did not recognize them and said " They are not my brothers, for they are small." She was greatly emaciated, her skin transparently pale like that of a man dying from hunger; but on that day she began to take up her life again, had a good appetite, could read fluently, spoke with one of her schoolmates of the past; and 14 days later, got up and took part in the housework, although her movements at first were lacking in skill. She never spoke of the past. It was as if a thick veil were drawn over the whole period.

Dr. Toedenströn emphasizes the fact tthat Caroline looked remarkably young. She had slept the whole period from puberty to the climateric, the whole period of womanhood. She was a child and wished to remain a child. Dr. Stekel thinks that her questioning after her mother when she awoke indicated the disorder called psychic infantilism, although this seems very slim evidence.

This is the most remarkable case on record, but many others somewhat similar have been reported. Dr. Stekel cites a newspaper report of the case of three maiden ladies in Prague. In a quiet house in that city lived three sisters, and for some days nothing was heard from them. They were not seen on the street; the doors of the house remained closed. The neighbors suspected crime, or that they were ill. The police were informed; they broke into the house and found the three sisters all asleep in their beds, barricaded as if they had retired to a fortress, and very unwilling to be awakened. Their purpose was to sleep through the whole of the war. They would hear nothing more of all the cruelties, of all the bloodshed and sacrifices of fighting. They wished to sleep and to awaken when peace had come. It appeared that they would have slept for many months if they had not been awakened.

The Hygiene of Sleep

The importance of the hygiene of sleep is realized if we recall a few facts. It concerns a third of life directly, the health and efficiency of our whole life indirectly. In the early years it concerns half of life directly. Prolonged lack of sleep results in the production of a special toxin. Insomnia is not only an evil in itself, but made worse by the unnecessary fears apt to be associated with it.

About all the physiologists give us is a general statement in regard to the hygiene of sleep. Stiles, in his excellent Physiology, for example, says that we do not know whether one should sleep 5 or 6 hours or more than that; that the best sleep is that which seems to have been dreamless, as we look back upon it; that it is a sign of nerve fag when the thoughts of the night closely resemble those of the day.

Plenty of books give instruction in regard to the way to go to sleep and the way to avoid insomnia; but while the directions are often delightfully simple, an attempt to apply them practically may fill one with disgust.

Among the popular opinions in regard to sleep it is maintained by some that intellectual work after the evening meal is bad, others resort to reading as a narcotic; it is held by some that exercise is bad, and by some that exercise will produce sleep; by some that eating just before retiring is an advantage, by others that it is an injury; by some that a bath is good, by others that it keeps one awake; by some that one should get to bed at a regular hour whether sleepy or not, by others that it is well to stay up if wide awake; some have special devices for producing sleep, others get up if they cannot sleep and make the best of it.

Clearly there are certain deeper underlying principles to be considered. First of all are the individual differences. As regards one's relations to the goddess of sleep they must always be individual and personal; but one further generalization seems to be established. The reason one cannot sleep when in the customary situation for sleep, i.e., ordinarily when one goes to bed in a dark room, is that the excitement of waking hours persists. Mental activity does not cease when we lie down, as does our bodily activity. Thus, as everybody knows, sorrow, anxiety, fear, worry, great joy, or strong emotion of any kind, keep one awake. Hence the conflict of opinion in regard to food, exercise, and the like. If study at night leaves one in a condition of persisting excitement, or if physical exercise, or social entertainment, or a bath, or reading, or food, or drink does this, then such things keep one awake. If, on the other hand, one is not physically weary, a walk or the like may reduce the excitement. A light lunch may do the same, reading may help, and even rather violent activity or energetic expression of emotion, by causing a normal explosion of energy, may reduce the excitement and bring about sleep.

Thus the more completely we can shut out sensory stimuli and relax attention, the more likely we are to sleep. Whatever causes persisting excitement is likely to cause sleeplessness, whatever reduces the excitement is likely to produce sleep. It all depends on the character of the individual on the one hand, and the temporary condition of the individual on the other.

A few things of practical significance can be briefly stated. First of all are the so-called substitutes for sleep. Most of them are helpful chiefly perhaps, because they prepare the way for normal sleep rather than for the benefit that comes from them directly. Among them are the following:

(1) The condition resembling sleep that comes from the use of various drugs. A large number of hypnotics are now on the market and widely used,—sulphanol, trianol, paraldehyde, chloralimede, and the like. According to Stekel many

persons are addicted to the use of these drugs. It is doubtful whether they cause genuine sleep or not. Verworn maintains that they do not, that, on the other hand, they cause a condition of asphyxiation so that the nerve cells cannot appropriate oxygen normally. Their value comes from the fact that they quiet the nerves, and normal sleep follows after the drug effect has passed away. In some cases it is necessary to use them; but apparently, where sufficient, it is better to use the bromides to quiet the nerves rather than the hypnotics.

(2) Is the hypnotic sleep. Deep hypnosis has been used in some severe cases of hysteria with helpful results. The patient is put into deep hypnotic sleep and kept asleep for days or weeks at a time. This method does not seem to be in favor, and probably should be used only in most extreme cases.

(3) Some people who are forced to keep awake for long hours find it helpful to take an additional meal, which is often needed on account of the unusual activity of the person. This in many cases may prove helpful also in bringing about sleep.

(4) Is the use of neutral baths. The neutral bath is merely a bath at body temperature; and an individual can remain in this for a long time. Some find this an especially helpful substitute for sleep, and the advantage of it again is that it is very likely to bring about refreshing sleep afterwards. Some find it an advantage to sleep in the neutral bath if they can do so. It is said to have a wonderful effect in quieting the nerves. It is the standard remedy in the excitement of manic-depressive insanity.

(5) Is a condition of approximately absolute rest. Benedict found that if a person can sit quietly in a chair and make no movements and do nothing whatever, the metabolism is reduced as much as in sleep. Especially is it desirable that attention itself should be in abeyance.

The condition last mentioned is so important that it should be considered somewhat in detail. The experimental studies, especially those of Sidis, show the importance of subwaking states. What Sidis distinguished as the hypnoidal state seems to be merely a condition in which attention is reduced to a minimum or at least functions on a low level; and, as already noted, this seems to be the condition out of which sleep, on the one hand, and hypnosis on the other, are easily developed. A condition approximating this with relaxed attention is perfectly normal and probably the best substitute for sleep and the best preparation for sleep.

A delightful illustration of this normal condition of reduced attention has been given by Mr. W. H. Hudson in his interesting book, "Idle days in Patagonia." Mr. Hudson describes his experience in part as follows:

It was his custom, he says, to go out every morning on horseback, into the grey, universal thicket, where he was all alone. Day after day he returned to this solitude and yet he had no object in going, there was nothing to shoot, the weather was cheerless, there was nothing novel to be seen. "All day there would be no sound, not even the rustle of a leaf;" but he wandered aimlessly at a slow pace, and at noon time would rest, although he was never tired, in a little grove of trees that he had selected apparently at random and for which he formed an habitual apperception, probably conditioned reflexes that favored his rest. He says:

> "But during those solitary days it was a rare thing for any thought to cross my mind. In the state of mind I was in, thought had become impossible. My state was one of *suspense* and *watchfulness;* yet I had no expectation of meeting an adventure, and felt as free from apprehension as I feel now while sitting in a room in London. The state seemed familiar rather than strange, and accompanied by a strong feeling of elation; and I did not know that something had come between me and my intellect until I returned to my former self,—to thinking, and the old insipid existence again."
>
> "I had undoubtedly *gone back;* and that state of intense watchfulness or alertness, rather, with suspension of the higher intellectual faculties, represented the mental state of the pure savage. He thinks little, reasons little, having a surer guide in his (mere sensory perceptions). He is in perfect harmony with nature, and is nearly on a level, mentally, with the animals he preys on, and which in their turn sometimes prey on him." (Quoted by James, "Talks to Teachers," p. 262.)

Attention is an instinctive reaction genetically similar to the tropisms of plants and animals. In any of the higher animals a hierarchy of habits based upon this fundamental reaction is likely to be developed, and the lower and more fundamental may exist along with the higher and more complex. The individual often retains the power of dropping back into lower and more fundamental modes of activity, and this is often done with the distinct feeling of satisfaction that we may often observe in ourselves. For example, as Dr. Gulick has noted, on the beach in a summer vacation when we dig idly in the sand or let it trickle through our fingers.

This ability to fall back into lower and more generic forms of instinctive activity is distinctly desirable.

It would be of the greatest value to many business men and other intellectual workers if they could acquire the habit of relaxing, whenever opportunity permits, into such stages of attention. If the habit of working hard and with intense concentration for short periods were acquired, it would be possible for most men to find opportunity several times in the day to drop back into this more primitive condition of attention. Many great men, General Grant, President Harper, Dr. Pepper of the University of Pennsylvania, and others, have had the power of dropping asleep whenever opportunity offered, on the battle field or in the office. Few men can acquire this habit, but most people can acquire the habit of relaxing to this more primitive level of mental activity. To use a crude mechanical illustration, this is similar to dropping from high speed into low in climbing a hill with an automobile, and probably is as great a saving of strain.

While such complete rest with relaxation of attention is apparently the best substitute for sleep and the best preparation for it, nevertheless it should be noted that fatigue and insomnia are two very different things. The investigations by Piéron have shown that muscular fatigue, for example, does not necessarily indicate a need for sleep; and on the other hand the imperative need for sleep that results from prolonged insomnia does not necessarily mean fatigue. Thus it may happen that an individual suffering from insomnia may be better off engaged in certain occupations than attempting to rest when not really tired.

Practical Rules

Assuming then for the time being that sleep is an instinctive reaction we have noted that, like the other great instinctive impulses, it rests upon the fundamental characteristic of the human organism as a mechanism for reacting to stimulation. Likewise, just as in case of the other instinctive reactions, there are liable to be inhibitions, perversions, and latency of this instinct, it is always relative to other instinctive reactions, may take the place of them or in turn be inhibited by them; and connected with this, perhaps differentiated from it, are many related phenomena such as hibernation, aestavation, hypnosis, drowsiness, the hypnoidal state, and the like. From this, or on the basis of this, habits of response are built up, and associated stimuli in vast variety may bring about this reaction as a conditioned reflex. Of concrete hygienic suggestions the following are important.

(1) Of course the ordinary commonsense rules should be followed, and children should be trained not to take tea or coffee or hearty and stimulating food nor engage in exciting occupations just before going to bed.

(2) It often happens that special preparation for sleep is necessary. The poets have rightly represented sleep as a goddess whose favor must be wooed. From the point of view of hygiene this is the correct attitude. We cannot expect that

this proud and fickle goddess will grant her favors to those who come to pay their respects directly from all kinds of selfish activities, exciting and frivolous occupations, or even from absorbing and strenuous labors. On the contrary, people are often too tired to sleep and must rest for a time; and again the activities of the day are too exciting, and the goddess will grant no favor until this excitement and turmoil have passed away and a more serene and proper frame of mind acquired. All of the various substitutes for sleep may thus be helpful as preparation for sleep itself.

Dr. Sidis (28, p. 10), describes a method he has tried as follows:

"I began to experiment on myself and found that I could put myself almost at any time into a state of deep sleep by closing my eyes and keeping perfectly still, dismissing all ideas from my mind—closing shop, so to say. I was able to put myself into a quiet, prolonged and often very refreshing sleep. I have further succeeded in the treatment of many cases of insomnia, by following the same lines, in bringing about good therapeutic results."

(3) Especially is it important that children should be trained to make preparation for sleep. At the close of the day it is fitting that they should give up their more boisterous sports and occupations, sit quietly in the family circle, and rest from the more severe occupations of the day; such quiet hours are not only valuable in themselves for the mental health of the children, but the best possible preparation for the instinctive reaction of sleep.

The relation of dreams to health is another story not in place here; but perhaps usually, especially in case of children, if the work of the day persists in the dreams at night it is a sign of nervous fatigue. Children frequently continue their reckoning at night and are tormented with sums and other tasks of the school work. It is thought in general that when we dream it is a sign of normal dreaming if the dreams concern events long past and things that are not directly related to the day's work.

Whenever normal reaction to stimulation, especially strongly emotional stimuli, has been repressed, this is likely to interfere seriously with sleep. A repressed reaction of any kind may be a serious cause of insomnia, or may bring about the condition of attentive sleep. Especially the effort to solve a puzzling problem, whether concerning one's own conduct or a problem in mathematics, just before going to sleep, is likely to bring about the condition of interference of association which is characteristic of attentive sleep. Such problems should always be avoided at night unless it is possible to solve them satisfactorily. And it is noteworthy that a very slight affective stimulus not normally reacted to may be sufficient to interfere with sleep.

Again children should be trained to settle their moral accounts every night and never to hold a grudge, but if they have any grievance or the like, to settle the matter before going to bed, and wipe the slate clean from all the worries and troubles of childhood. A wise and tactful mother can train her children in this way so that when they go to bed at night the mental attitude is serene, and attention, as well as muscular tone, is relaxed. Then the individual is likely to sleep normally; but if one goes to bed with anything special on the mind, then the condition is likely to be that of attentive sleep.

(4) A whole group of habits in regard to going to sleep are of fundamental importance; and to a large extent children can be trained to healthful habits by proper care. A large number of conditioned stimuli to sleep are developed in the early years, and these should be wholesome and desirable. Among those which should become habitual in the production of sleep are, of course, darkness, a healthful posture, and perhaps the sight of a couch, and the sensations connected with closing the eyes, and the like.

On the other hand, the habits developed in many children of going to sleep in the light, and of dropping to sleep in a bad posture, or without proper arrangement of the clothing and the like, are bad. And further, the sound of the mother's voice or that of the nurse in singing, reading, telling stories. the dermal sensation from rubbing, patting, and the like, while desirable on special occasions, are of doubtful value from a hygienic point of view as habitual conditioned stimuli. It is much better that the child should become habituated to conditioned stimuli naturally and normally present in an hygienic environment, namely, darkness, the sensation from a suitable posture, and good air. Distinctly unhygienic are of course the various artificial stimuli, such as pacifiers, soothing syrups, the presence of a dog or cat or other animal, and toys of any kind that cannot be kept suitably clean.

Since the sensation from any receptor organ may become a conditioned stimulus, and this is probably true for the reaction of going to sleep as well as for other reflexes, it is quite possible for many conditions to be helpful as adjuvant stimuli in bringing about sleep. Thus a man may be helped by smoking a cigar, by taking a light lunch, by reading a newspaper or reading what Oliver Wendell Holmes has called nightcap authors, not merely because they soothe the mind and bring about a mental attitude favorable to sleep, but also probably in many cases because such reading involves conditioned stimuli that become associated with the natural stimuli to sleep. Thus sermon and lecture may have an hygienic and hypnotic value, and in some cases be especially effective. It was the poet Southey, if I mistake not, who tells of his struggles with insomnia and the various devices to which he resorted,—counting, repeating things learned by heart, the visualizing of an interminable flock of sheep jumping over a wall, or the like, but nothing was effective until he recalled his old lecture room in college, the voice of the lecturer, and the sleepy attitude of his fellow students. This at once was effective, and so after many years he found evidence of the hypnotic value of lectures.

(5) If we accept the view that the reaction of sleep is an instinctive reaction, it follows that the general principles applying to instinct apply to a large extent here. For example, it is never safe to fool with an instinctive reaction, as various perversions and inhibitions are liable to occur. Thus if children are continually wakened when they are still in need of sleep, or if they sleep with disturbing conditions, unfortunate habits of attentive sleep or even of insomnia may be developed.

(6) From a hygienic point of view, in accordance with what seems the natural sequence, sleep should precede exhaustion when possible. If one has a strenuous piece of work to perform it is better to have extra sleep before the task than afterward, since in the latter case not only is more harm done to the nervous tissue by the strain of nervous work, but it is often impossible to sleep in a condition of exhaustion.

(7) The time of sleep is apparently important. It is obviously much better to sleep at night than to sleep in the daytime, and yet there may be individual differences. Some take their sleep all in one dose, others, especially in hot countries, take it in two doses, and some find it an advantage to take many small doses whenever opportunity offers.

In our modern life, as pointed out in the recent article by Professor Patrick, the tendency is more and more to transfer the activities of the day to the night; and so more and more the day has been lengthened into the hours of darkness and the night extended into the morning. As an offset to this Professor Patrick emphasizes the distinct hygienic value of the daylight saving plan. He says (19a, p. 395):

> "Probably the real reasons for our ever increasing night life are of a profound psychological nature. There are two distinct prin-

ciples involved here. First, artificial light exercises upon us a peculiar fascination not possessed by sunlight. This is due to certain mental associations coming down from the primitive life of man. Fire is the original source of artificial light, and fire and light are associated in the mind. The campfire or the fire on the hearth suggest feasting and joy after the labor of the day and in winter suggest warmth and comfort. After the strenuous labors of the day in forest and field comes the pleasant relaxation of the evening, and whether this takes the form of feasting or dancing or music or the telling of tales, the campfire is the center of this joyous social life. This deepseated association fixed by centuries of ancestral habit explains that peculiar feeling of pleasure which we have when the lights are lighted at night. When theatrical performances are held by day, no matter how well lighted the theater may be, we all prefer to darken the windows and use the electric lights, while the lure of the great city is partly due to the glitter of the brilliantly lighted streets and places of amusement."

(8) The amount of sleep is important. There are great differences in the dosage of sleep as well as in the way this is divided. Some seem to get on well with six hours of sleep, others need nine or ten.

Children should be habituated to long hours of sleep, 12 to 14 hours up to the age of 4; 11 or 12 hours to the age of 9; 10 hours to the age of 15, and thereafter 8 or 9 hours.

According to Stekel, there are the greatest individual differences as regards the need of sleep. He says that he himself needs at least five hours of sleep, suffers seriously if he does not have this; but on the other hand, is likely to feel uncomfortable if not ill when he has more than six and one-half hours. He cites Virchow, Mumson, and Goethe. Virchow needed only a few hours of sleep; and he maintains that men of genius usually need very little; men who are doing intellectual work need less than those performing muscular labor. He has found men who are active mentally and on an average completely satisfied with six or seven hours of sleep. Youth need more sleep than older people; active and bright children sleep less; and there are children who suffer from sleeplessness at a very early age. It is useless to lay down any general rules. The necessary amount of sleep is an individual matter.

(9) There seems to be danger from sleeping too much. Again, according to Stekel, many neurotic persons, dissatisfied with life, flee from the real world and take refuge in the world of dreams. Frequently they fight all night long with temptation and become so weary that they waken in the morning with dulled spirits and go to work with a headache. It is absolutely untrue that we can strengthen the nerves by sleeping a long time, says Stekel. On the contrary, the nervous individual should avoid too long sleep because his nervous-

ness rests on the fact that he lives in severe conflict between the demands of culture and the impulses of his passions. Many nervous people maintain that they have to sleep 8, 10, or 12 hours, in order to feel well. But nothing is more injurious for the nervous than too long sleep, Stekel maintains. And many cases of nervousness can be cured by stopping this over indulgence in sleep. People that sleep so much wake in the morning tired and dull, they are never satisfied, they are always fighting with the impressions of the night and do not feel well until toward evening. Among other bad results of sleeping too much are gallstones, stones in the kidneys, migraine, all of which have a certain relation to oversleeping. Stekel probably over-emphasizes this; but the subject should be investigated.

(10) The neurotics are always worrying for fear they will not sleep. Back of the question shall I sleep to-night, Stekel maintains, is concealed an anxiety in regard to sleeping and dreaming. Such people wish to separate rigorously the world of the conscious and the world of the unconscious. They grasp at the hypnotics, which deaden them, and the taking of drugs is the real beginning of severe pathological insomnia. The patient soon becomes a drug victim and the organism demands its daily narcotic. Anxiety is aroused lest one may not sleep without the hypnotic. The doses must be continually increased, so that finally a condition of toxaemia develops out of the sleeplessness. Formerly, according to Stekel, they were only the victims of morphine, but now there are people who take enormous doses of veranol, sulphanol, trianol, paraldehyde, etc.

Some people maintain that they do not sleep. There is, however, no such thing as absolute sleeplessness. (19) Patients come to a physician and say that they have not slept for three months. Others say they have not slept for half a year or more. This, however, is not true; and even those who give as proof the fact that they heard the clock strike every hour, really slept between the hours. The results of sleeplessness are over-estimated. Fear of insomnia is often only a mask and conceals really a fear of sleep. Many men are afraid of sleep. There are patients who go to sleep and then wake up as if they were hit by an electric shock. They dream that they are falling from a high mountain and the like. Of such nervous feelings many neurotics complain.

For such neuroses as Stekel describes apparently drastic remedies are necessary. Perhaps in many cases the best remedy would be the application of the general principle of mental hygiene for phobias. Make the individual do the thing that he fears. In case of children and adolescents probably all that would be necessary would be to tell the patient to keep awake, assuring him that it would do no harm to lie awake in case one does not readily fall asleep. The attempt to lie awake is likely at least to remove the fear of insomnia.

Stekel, writing during the war, points to the fact that the war was the great enemy of sleep, as all classes were in a ocndition of undue excitement. The experiences of multitudes during the war illustrated the injury that comes from attentive sleep and the inability to control the excitement. Stekel has given interesting illustrations; and frequently, if not usually, after a time this attentive sleep results in insomnia.

Stekel tells the following story illustrating the tormenting sleeplessness from which many of the soldiers suffered; the case of a battery officer decorated with the highest insignia showing that in the first three months of the campaign he had taken part in 29 battles and lost only three men. He had no ground for fear and was never fearful. In spite of this he could not sleep for the whole three months. He always heard again the well known signals which warned him of an outbreak. He remembered in dreams commands that he had neglected; he dreamed, if he fell asleep, that he was in a battle and was about to fall over. Presently he woke again with his heart thumping, and he had to leave the front several weeks and go home in order to sleep regularly.

According to Stekel, it is a characteristic mark of the war neuroses and psychoses that all these patients, along with the great weakness and irritability and loss of will complain of sleeplessness. The insomnia is so obstinate that it defies the usual measures. Improvement comes with regulation of the sleep function. The patient begins to sleep first a few hours, then more, until finally the sleep amounts to five or six hours, which is an extraordinary result.

(11) One final precept, summing up what has been said, should be given. The last ten minutes before going to bed should be sacred to health and largely devoted to prevision of the physical needs of the night. In these few minutes one can determine largely the health character of one's reactions for the next eight hours. Then one should make good any physical need—lack of water, food, clothing, heat, cleanliness, or medicine. Purge the mind as well as the body of the poisonous products of the day's activity, worry, fear, any ill will, or grudge, or evil thought, and for once at least in the day make the attitude peaceful and healthful.

Conclusions

In view of the facts in regard to sleep, and from our general point of view, the following inferences seem justified.

(1) Sleep is an instinctive reaction to stimuli similar to the reaction of attention.

(2) The biologically adequate stimuli that produce sleep are primarily fatigue and darkness, and perhaps several physiological conditions. The associated or conditioned stimuli that tend to produce sleep are varied and may be anything whatever. Usually an environment free from the more violent stimuli is directly conducive to sleep.

(3) The reaction of sleep is one of inhibitory character, and this usually comes on gradually and becomes more intense and finally disappears gradually.

(4) The reaction of sleep, according to the recent investigations by Pavlov's students, is localized in the hemispheres of the brain and may be diffused from one part of the brain to another.

(5) The reaction of sleep may be partial or it may be complete. When it is partial certain conditioned reflexes are abolished and others are not abolished. In an early state motor conditioned reflexes may be present and the conditioned reflexes of secretion by certain glands may be absent; later the secretory reflex may be present and the motor reflex absent; and finally in complete sleep both motor and secretory conditioned reflexes are inhibited. In waking the conditioned reflexes reappear in reverse order.

(6) Sleep may be attentive or inattentive. In attentive sleep a portion of the brain seems to be partially awake; or, to put it as Sidis does, we are awake for certain stimuli.

(7) Sleep may be imaginal and associative or it may be imageless. The latter is dreamless sleep, the former of course is a condition of more or less orderly dreaming. While some maintain that dreamless sleep never occurs, there seems no satisfactory evidence for this assumption. On the contrary, since conditioned reflexes are abolished in animals, probably the power of association is inhibited.

(8) In imaginal or dreaming sleep the brain apparently, or a portion of it, is partly awake. The significant discovery by Pavlov's students that conditioned reflexes do not occur normally in sleep, suggests that here may be a clue to the fact that our dreams are so erratic. The abolition of the conditioned reflexes means that the cerebral cortex is not functioning normally, the association processes are not being carried on as in daily life. In our ordinary waking experience we always correct our thinking by constant reference to facts

and by other associations which have been developed from the facts of experience. In dream life this correction does not occur, and the fact that the associative processes of the cortex are not fully functioning gives us a plausible reason why this correction is not made.

(9) Various toxins produce sleepiness; and certain drugs produce a condition which superficially is similar to sleep, but really is probably very different.

(10) Sleeplessness is usually caused by intense stimulation, or conditions of excitement, which act as stimuli to waking reactions. According to Claparède, when waking activities are more interesting than the reaction of sleep, we instinctively keep awake. When sleep is the dominant momentary interest, we go to sleep.

(11) As Piéron says, modifying the teleological statement of Claparède, we sleep not because we are exhausted but before we are exhausted.

(12) Demonstrating that sleep is a phenomenon contingent to life, but not implied in the conception of life itself, the phylogenetic origin of sleep has been suggested as an inhibitory function of defense, which plays a great rôle in the struggle for existence among animals and men.

(13) Many related states, hypnosis, the hypnoidal state which precedes ordinary hypnosis, the hibernal sleep of animals, are for the most part to be explained from the same point of view, as instinctive reactions to certain stimuli.

(14) Whether we accept Claparède's theory or not, there is good evidence for at least considering sleep as coming under the general principle of stimulation and response. Both the experimental and the physiological evidence give good ground for this view. From this point of view the hygienic aspects of the subject are best seen.

The hygiene of sleep is that of instinctive reactions in general. There should be no repression, no artificial interference, no postponement, no perversion; in case of children no curtailment, no interference; and normal habits of sleep should be developed on the basis of the instinctive impulse. Interference with an instinctive reaction is always liable to be dangerous. Interference with sleep, by improper food, by drugs, by exciting activity, or worry, causes attentive sleep, insomnia, the fear of insomnia, or the like. Nothing perhaps would add more to the health and efficiency of people, in this country especially, than the practice of hygiene in regard to sleep; and the development of a scientific hygiene of sleep for children and adults would be one of the greatest contributions to somatic as well as mental hygiene.

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MALNUTRITION AND HEALTH EDUCATION

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Organization of Classes

The conclusion of our work last year led us to the decision that it would be wise both to carry on the work with some of the same children, and also to set up an entirely new experiment. To carry out the first purpose the principal of the school[1] arranged for two open air classes, of which the children should be, as far as possible, those who had been in our nutrition classes the previous year and who were still seven per cent or more underweight for their height. Altogether in these two open air classes 48 children of this type were included. The number of children with various percentages underweight are shown in Table I. The first column gives the distribution of percentages underweight from 21 to seven per cent. Columns two and three show the number of children in the two groups who were the various percentages underweight, while the final column gives the total number in the two classes. There were 13 children ranging from seven to nine per cent underweight; three of the 48 were from 19 to 21 per cent underweight for their height.

In arranging for the new experiment we selected the fifth grade children as the most desirable since they were about the

TABLE I

Distribution of Percentages Underweight at Class Entrance

	Open Air		
Per cent	Group 1	Group 2	Total
—21 —19	1	2	3
—19 —17	2	..	2
—17 —15	3	..	3
—15 —13	6	4	10
—13 —11	3	3	6
—11 — 9	3	8	11
— 9 — 7	8	5	13
Total	26	22	48

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[1] Public School 64, Manhattan, is for boys only and has an enrollment of over 3,000. Mr. Louis Marks is principal. See Ped. Sem., xxvi, 1919, pages 1-26.

TABLE II

Distribution of Percentages Overweight and Underweight

Percentages	Fifth Grade Classes		Total
	5A-X	5A-Y	
53 —51	1	..	1
....	..	..	..
25 —23	1	..	1
23 —21	..	..	..
21 —19	..	..	..
19 —17	..	..	..
17 —15	..	1	1
15 —13	..	2	2
13 —11	2	4	6
11 — 9	6	1	7
9 — 7	7	..	7
7 — 5	8	2	10
5 — 3	3	4	7
3 — 1	9	6	15
1 — 1	16	11	27
— 1 — 3	13	6	19
— 3 — 5	19	4	23
— 5 — 7	12	7	19
— 7 — 9	21	10	31
— 9 —11	9	8	17
—11 —13	5	..	5
—13 —15	5	1	6
—15 —17	1	..	1
—17 —19	..	..	..
—19 —21	1	..	1
Total	139	67	206

same age as the majority of the other children, and also, up to the time of this measurement of them they had had no training through our nutrition classes. The children were organized in two groups in the school system. In one group there were 139 and in the other 67. The distribution of the percentages overweight and underweight is shown in Table II. They ranged from 53 per cent over- to 21 per cent underweight. In one group, 17 children are seven per cent or more overweight, 80 are within seven per cent of average, and 42 or 30 per cent are as much as seven per cent underweight.

Owing to the epidemic of influenza and necessary rearrangement in the school organization the classes of fifth grade children were not organized for approximately seven weeks after the initial weighing. At this time 39 of the 42 5A-X children were again weighed. The distribution of weight is shown in Table III. The second column gives the distribution at the first weighing. None of the children is less than seven per cent underweight. As shown in the third column, the children seven weeks later had increased so that they were markedly nearer the average weight. Twelve of the children were within five to seven per cent underweight. Nine of them were from three to five per cent, while one had come up to within three per cent of average weight. A total of 22 children at this first class meeting would according to our accepted standards be considered as being above the "dead-line" of undernourishment.

Several reasons for this progress might be given. In the first place, regularity in school life, as contrasted with the irregularity and unsatisfactory conditions of city living during the summer time, might be advanced as a possible cause. On the other hand, there is some reason to believe that this increase in weight was apparent rather than real. The first weighing of the children occurred in the latter part of September, a time of great heat with consequent light clothing. The second weighing occurred in November when the temperature had dropped considerably, and in some cases, if not in all, the children had commenced wearing heavier clothing. If the latter explanation is the true one, and it undoubtedly is a contributing factor, we are led to the consideration of the reliability of fine determinations. It is possible that increases or decreases in weight may be due to variations in the clothing rather than to the observance or neglect of prescribed conditions.

TABLE III

PERCENTAGE UNDERWEIGHT AT FIRST WEIGHING AND FIRST CLASS MEETING

Percentages	Fifth Grade Group 1st Weighing	1st Class
1 — 3	..	1
3 — 5	..	9
5 — 7	..	12
7 — 9	19	8
9 —11	11	4
11 —13	4	1
13 —15	4	2
15 —17	..	1
17 —19	1	1
Total	39	39

Physical Examinations. Each child in the class was given a physical examination, which was planned to cover such features as bore definitely on the nutrition of the child. In all cases which seemed to show naso-pharyngeal obstruction, the advice of a specialist was obtained. The open mouth, mucus discharge, granular throat, dull or retracted ear drums, and enlarged, buried or cryptic tonsils were indicators. Throughout the school year operations were performed in 23 of the 32 necessary cases.

Social Environment. The section in which the school stands is somewhat removed from the worst slums. In none of the 87 families visited has there been evidence of inflated incomes due to war industry. Rather has it been true that with the majority there was increased hardship due to loss of their wage earning members and to the increased cost of living.

School Environment. The children were housed in a modern building equipped with shops, baths, auditorium, and yard space, while a well conducted eye clinic which served the district under the Department of Health was given room in the building. The daily use of the nearby park and the social activities represented by the Boys' Club, the Settlement, and the Library, enriched the curriculum considerably. The school had stood for many years as one of the most progressive in the city.

Weekly Weighing and Interviews. At the time of the weekly weighing, there was an interview of five to ten minutes with each boy. Data were collected under the following heads: weight, rest periods, lunches, number of hours sleep the previous night, amount of food, coffee or tea, water at meals, windows open, lack of breakfast, rapid eating, excessive fatigue, colds, clothing, and any other significant facts.

Charting. Charting of the weekly gain or loss together with data such as the number of daily rest periods and lunches, the use of stimulants and the number of calories, was done prior to the class exercises.

Measured Feeding. A record of the kind and amount of food taken for forty-eight hours was kept weekly by each boy in a book in which there was a table showing 100 calorie portions of various foods. This table was a source of interest and most of the children chose to figure their own caloric intake and did so with considerable care and success. The use of this book made it possible to introduce gradual changes and increases in diet along the line of least resistance. Thus, by the addition of a few prunes, a pat of butter, an extra glass of milk, or a slice of bread, a child can easily obtain the amount of food required.

Class Periods. For the instruction the charts were arranged with the one showing greatest gain for the week placed first and the others following in regular order. The children took seats in the relative position of the charts. A half hour was then spent analyzing the records and taking up questions such as; what constiutes good nutrition, the uses of food, the significance of measured feeding, the value of certain foods, and food habits.

Home Visits. Because it proved too difficult to persuade the mothers to attend the class periods regularly as is done at the hospital nutrition clinic, it was necessary to increase the number of home visits considerably and miniature charts were carried into the home to be studied there.

Control Investigation. For two reasons we wished to study a group of normal children. In the first place, we could not tell whether the underweight of some of our children was temporary or chronic. By selecting a group of children who were approximately average weight for their height at the time of the first weighing, and by repeated measurement, we could determine the extent of the variability. In the second place, in order to check up on our psychological investigation of the undernourished child we must have similar data secured through experimentation with wellnourished children. Table IV shows the results for 35 children. The first column of this table indicates the percentage over- and underweight. The second column shows the distribution at the time of the first weighing, the second and third columns for two other weighings, at the beginning of the second school term, and in the final week of May. Unfortunately in this third weighing eight of the children could not be secured, so our results are for 27 instead of 35. The variability is quite marked. Whereas at the first weighing all of the children were within three per cent of average weight for their height, on the second weighing they varied from nine per cent under- to 12 per cent overweight, and on the final weighing the 27 children ranged from eight per cent underweight to five per cent overweight.

Results

In tabulating the results we have considered the gain as a percentage of the normal gain rather than a percentage of gain in excess of normal. The expected gain for any cihld is determined by taking the yearly increment for children of his age and finding a proportionate amount of increase for the period the child was in the class. Determinations were made for the first twelve weeks of the class, for the first nineteen weeks and the final weight which was for the open air class approximately thirty-two weeks, and for the fifth grade class approximately twenty-seven weeks. Besides this, there was calculated for the fifth grade class the percentage of gain for the seven weeks which elapsed between the original weighing and the first meeting of the class.

The results for both groups are shown in Chart 1. On the base line is indicated the periods for which results were calcu-

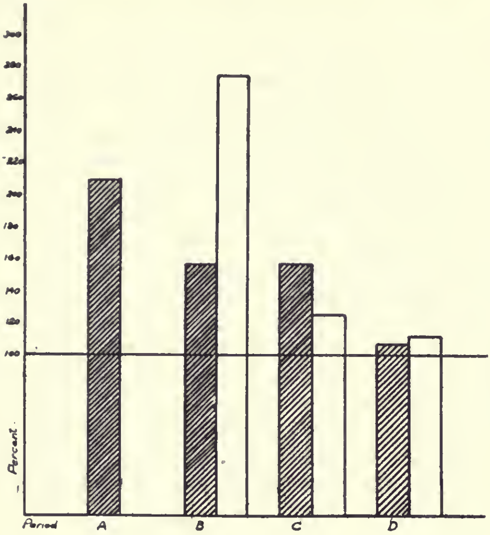

Chart I

TABLE IV

Percentages Underweight for Three Weighings

	Control Group		
Percentage	1st Weighing	2nd Weighing	3rd Weighing
—9	..	1	..
—8	..	..	1
—7	..	..	1
—6	..	..	3
—5	..	1	1
—4	..	..	1
—3	7	3	..
—2	7	1	3
—1	4	3	3
0	6	5	6
1	4	4	..
2	3	3	4
3	4	3	2
4	..	1	1
5	..	2	1
6	..	4	..
7	..	1	..
8	..	1	..
9	..	1	..
10	..	..	..
11	..	..	..
12	..	1	..

lated; A, the first seven weeks for the fifth grade classes; B, the first twelve weeks of instruction; C, the nineteen week period; and D, the final result. The figures at the left hand side of the chart are percentages of normal gain. The height of the columns shows the average per cent of gain, the shaded column indicating the fifth grade group and the plain column the open air classes. The open air classes in the first twelve weeks increased 274 per cent of the normal gain, whereas in nineteen weeks it was 125 per cent, and in the entire period 111 per cent. The difference is not so great for the children of the fifth grade classes. In the first seven weeks between the original weighing and the first meeting of the class, the average percentage gain in relation to normal was 208. In the first twelve weeks of the classes it had decreased to 156 and was approximately the same for nineteen weeks, but for the entire period it was only 106 per cent. In other words, the effect is marked in the beginning of the work, but constantly decreases until the expected rate of gain is reached.

Chart 2 shows the percentage gain for the children of the

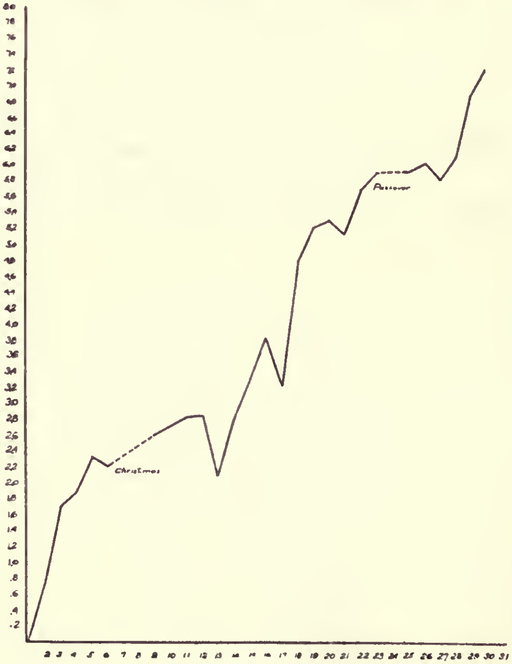

CHART II

fifth grade classes for each week. It is constructed so that the base line indicates weeks and the figures at the left show the percentage of gain on the original weight. The gain for the entire period is approximately nine per cent. If the gain had been calculated from the two weights given at the beginning and the end of the period, it would have been approximately ten per cent, but we wished to have the record of the weekly gains so that we might if possible show the relation of various school periods to the children's progress. At promotion time the children register a loss of approximately 0.6 per cent. The recovery, however, is fairly rapid, an almost equal gain being registered the week following. In the same way, for parade week when there was a special holiday, the children lost.

A Physical Handicap. The effect of enlarged tonsils and adenoids on the nutrition of a child has long been suspected. A good indication of it may be obtained by comparing progress in a period previous to correction and in a similar period following operation. Of the 23 children for whom operations were arranged, only ten are available for this comparison. The reason was that we wished to have a period of at least five weeks after the child had returned to his original weight, that is, when he had recovered from the loss consequent on the operation. The relation of the gain during the second period to the progress during the first period is graphically shown in Chart 3. In this chart the percentage of gain is shown on the ordinate. The position at which the children were at the beginning of the first five week period is shown by the zero point. The average loss of four-tenths of one per cent for five weeks before the operation is shown by the first section

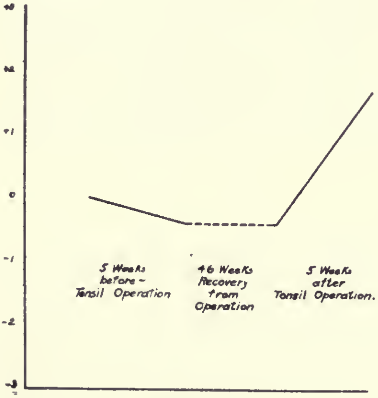

Chart III

of the curve. The elapsing of four and six-tenths weeks during which the children recovered the weight which they lost at the time of the operation, is shown by the dotted lines. The average gain for the five weeks following this recovery is shown in the third and final part of the curve. The rapid rise in this part of the curve is in sharp contrast to the direction in the first part.

Other Factors. We made investigations of the relation of caloric intake, the number of rest periods observed and the number of lunches taken, to the percentage of gain. In none of these cases did we find a clear cut correlation. Had our groups been much larger we might have been able to isolate one factor but with our small numbers it was impossible to make classifications in which only one factor was operative. In reference to these conditions we must wait for further evidence.

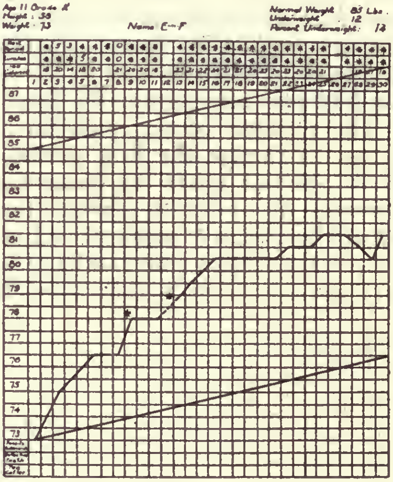

CHART IV

Individual Children. The record of Chart 4 is one where the evidence seems to be conclusive that the method of the nutrition classes is effective. The physical defects of this child had been to a large extent remedied before the beginning of this class period. His teeth were in good condition and enlarged tonsils had been removed before the beginning of this class. In other particulars his physical condition was fairly satisfactory. For postural defects a certain amount of correctional gymnastics was prescribed. So satisfactory was this child in observing the requirements that he insisted on keeping a record of calories at vacation time. Backing up this co-operation on the part of the boy, was that of the home. His parents were in fairly good circumstances and intelligently assisted in all the efforts which the school put forth for the progress of the boy.

The record of Chart 5 is of possibly greater interest. The conditions with which we have to deal are apparently similar. In this case the physical defects were minor. An operation for the removal of tonsils had been performed about four months before the beginning of the class. At the time of the examination certain conditions were noted which may have been the remaining effects of this abnormal condition. The anterior cervical glands were enlarged, the throat was granular and the ear drums were dull. The mother reports that no great progress was noted even after the operation and the record which we here present corroborates her statement. The curve for his actual increase in weight runs almost parallel with the line for the expected increase. In co-operation he was not so satisfactory as the previous child, as the record of mid-morning lunches and rest periods indicates. One condition which he did fulfill was to slightly increase the amount of food taken. The caloric intake of the last week is slightly higher

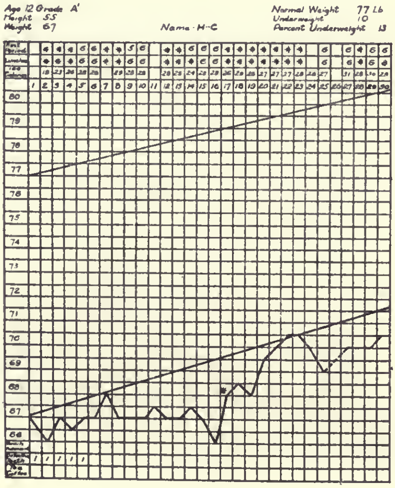

CHART V

than during the first part. This child shows very clearly the need for extensive investigations in the problems of nutrition. As a hypothesis, we may say that some children are biologically lighter in weight than other children of the same height. This child may be one of the extremes in that normal variation.

The record of Chart 6 is similar. At the time of the physical examination he had five carious teeth, four of which had been treated by the time of the class opening. Tonsils had been removed the previous year. The physician reported that the child was a mouth breather, that his throat was granular and that the cervical glands were considerably enlarged; also that the ear drums were dull and retracted. At an examination toward the end of the nutrition class period, his throat was reported in satisfactory condition, the tonsils presenting no difficulty, but four other teeth needed treatment. His general health seems to have been fair, the only diseases which he had had were whooping cough at four years and measles at five years of age. His record for rest periods, lunches and caloric intake is fairly satisfactory. His caloric intake for the first three weeks was lower than expected but later the amount seems to have been sufficient. Co-operation from the mother was very poor, the investigator reporting that illness, indifference, and ignorance, were the chief characteristics of the family.

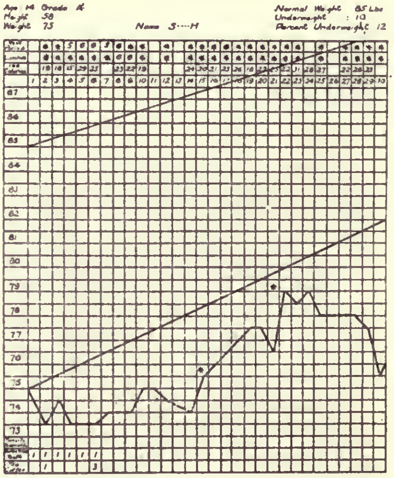

CHART VI

We have shown in the general discussion that the removal of enlarged or diseased tonsils was followed by a rapid increase in weight. Chart 7 shows one of the cases where there was a fairly good increase, even while the child suffered from this physical defect. Nevertheless, the gain in this case is more rapid in the first than in the later weeks. In the first two the child gained four pounds. He was then four and one-half pounds underweight. At the end of the class period, he was five pounds underweight. In other words, from the beginning of the third week of the nutrition class to the end, the gain was less than the expected gain. It may be that the removal of the diseased tonsils would have remedied the condition and this child would have reached the average weight for his height. There are, however, certain other factors to be considered. The child's stepmother was not particularly co-operative and according to the social investigator would be described as "queer." It may be that her attitude toward the boy was a possible factor in the progress. The child himself co-operated fairly well. In only three cases out of the total number of weeks did he fail to observe all the requirements of rest periods and mid-morning lunches. The caloric intake increased with the continuance of the nutrition classes. In the first few weeks the amount ranged from 1300 to 2100 calories, in the last few weeks from 2200 to 3000.

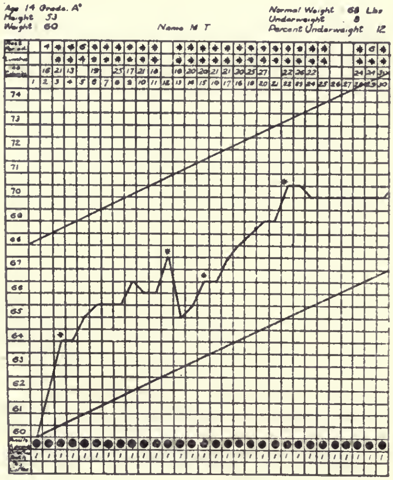

CHART VII

In some ways the conditions shown in Chart 8 are identical with those of the previous one. The child suffered from diseased tonsils throughout the year. He increased somewhat the caloric intake, going up from 2200 to over 3000 calories. He got his mid-morning lunch every day of every week. Other conditions, however, are quite different. He lived in a good home where the co-operation was good, but they feared the result of having an operation performed for the removal of the diseased tonsils. His throat was reported granular, the cervical glands enlarged and the ear drums dull. He had certain postural defects such as round shoulders and winged scapulae. It may be that the diseased tonsils were responsible for this child's failure to gain. Obviously it is necessary before any other conclusion is reached to have this physical defect removed.

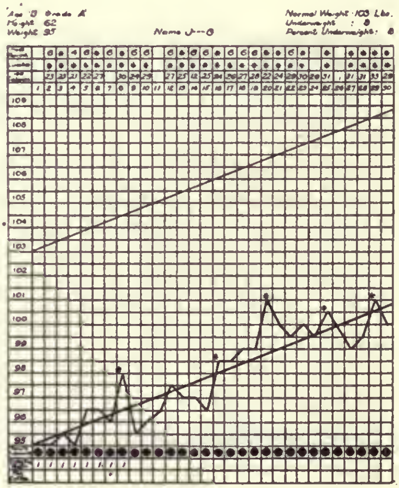

Chart VIII

The child whose record is shown in Chart 9 is one of those for whom we succeeded in having an operation for enlarged tonsils during the class period. He is also one of those whose gain after the operation was very good. In the beginning he was eight per cent underweight. By the end of the period he had come up to within half a pound of being the average weight. In the family situation there were certain other conditions which militated against rapid progress. Emotional

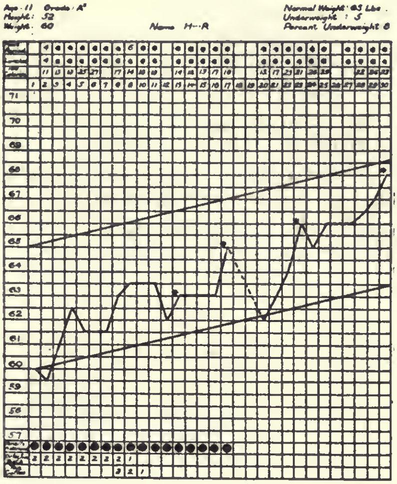

CHART IX

conditions, primarily antagonism on the part of other children because of favoritism to this child, seemed to play some part in determining the rate of progress.

Chart 10 gives the record of a child who was apparently in very bad condition at the time the class was organized. He

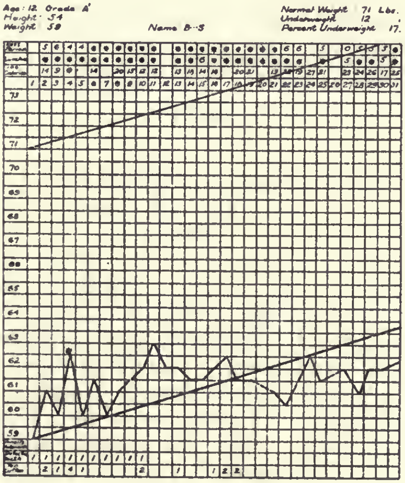

CHART X

was 17 per cent underweight. He had had an operation for diseased tonsils. The physical defects were insignificant, there being only one carious tooth. This child was, however, handicapped by the attitude of the family toward him. The investigator reports that he was "petted and spoiled." He was also one of the few children who succumbed to the temptation of tea or coffee. Nevertheless, these factors did not seem sufficient to explain his failure to make better progress. He has just failed to make the expected gain, being one pound more underweight at the end of the class period than he was at the beginning.

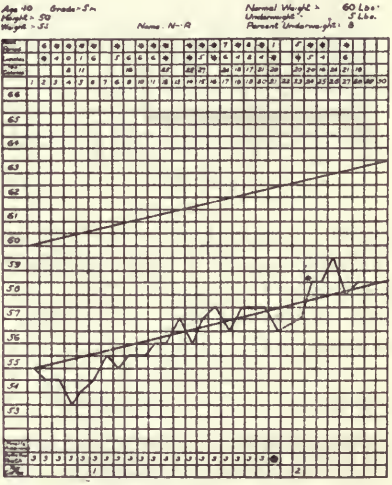

CHART XI

The child whose record is shown on Chart 11 presents serious difficulties. He has improved considerably, but he still shows symptoms of nervous instability. He is one of those children of whom it is suspected that there is a greatly increased basal metabolism. In other words, the amount of food necessary to counteract the waste due to the ordinary functions of living, such as respiration, heart action and so on, is very great. This child shows clearly the necessity of more information concerning the nutrition processes. His highly excitable and nervous condition may be a symptom or a cause. It is necessary that we understand some of the physiological and psychological processes before the diagnosis in this case is possible.

Philosophy of Nutrition Classes

At one time it was rather generally assumed that the fundamental cause of malnutrition was lack of sufficient food. Somewhat recently this notion has been considerably modified. Malnutrition is not unknown among children of the well-to-do, and in cases where children were receiving sufficient food there has been serious undernourishment. We have, therefore, been led to look for other causes than poverty.

It was with the consideration that undernourishment may be the result of ignorance and faulty education, that the Bureau of Educational Experiments was concerned when it planned to carry on the nutrition classes. As a tentative hypothesis we decided to assume that either the children had a sufficient amount of food or the necessary quantity could be procured. For the undernourished condition we might assume as a casual factor, ignorance, both on the part of the parent and child as to the desirable conditions under which food should be taken. From this point of view education is obviously a solution of the problem.

But this was not the only consideration urging us to set up an experiment in nutrition. First hand experience and opportunities for self-expression are as valuable in nutrition as in other fields. We believed that the approach to health education, where children had an oportunity to experiment and make original observations would inevitably lead to the most desirable results.

The instruction in our classes was concerned with what we may call certain positive or helpful conditions and certain negative or detrimental factors. The children were brought into the class room and there were displayed prominently before them charts of which those numbered four to eleven in this report are typical. The child who made the greatest gain for the week had his chart in what was recognized the head position in the line of charts. The other charts were arranged in the order of decreasing gain until at the opposite end of the line, the chart of the child who had made the least gain was placed.

The desirability of our class procedure must be seriously considered. We assume that a certain number of conditions were responsible for a child's failure to gain and that with the removal of these conditions, progress would be inevitable. Among the conditions which we considered detrimental were lack of sufficient rest, use of stimulants such as tea and coffee, failure to take time to properly masticate the food while one was in a restful position, the presence of carious teeth or diseased tonsils, and also excessive expenditure of energy in violent exercises or overwork. When a child had made progress, one of these factors where he had lived up to our requirements was sometimes emphasized as the reason. We told him that he was doing well and he should continue in the way in which he had been going.

The fact that the children made progress at times when they did not fulfill conditions militated seriously against the acceptance of our judgment. At the same time we reported to the children that the failure on the part of others to make progress was due to their lack of observance of the conditions which we prescribed. We spoke about the failure of a child to gain for whom an operation had been recommended for the removal of enlarged or diseased tonsils, and we emphasized that condition as being the one which made his progress impossible. Nevertheless, the children were able to see from the charts that gains were not made only by children free from enlarged or diseased tonsils, but that some children, as for instance the child whose record is shown in Chart 6, made progress despite the handicap. We found also children who consistently failed to make more than the normal rate of progress and who as far as we were able to determine, more faithfully observed our conditions than other children whose progress was more rapid. Considering all these facts, it is evidently necessary for us to reconsider our hypothesis and procedure and to question the effect of our instructions on the child.

We shall consider first the revision of the hypothesis. Unfortunately our group of children is not large enough that we are able to classify them in such a way that we may get an indication of the effect of one isolated factor. The fact, however, that some of our children consistently failed to make more than normal progress, leads us to the question of a possible biological variation which may be a perfectly normal condition for them. It is obviously necessary in order to answer this question to consider the progress of such children over a long period of time when the conditions which we consider important may be constantly observed and when the general health of the child may be definitely known. If, as we suspect is possible, a child may continue markedly under the average weight for his height and still show no physical defects nor an insufficiency of energy for meeting all the demands which life makes on him, it seems necessary for us to conclude that this child's condition is normal, or in other words is certainly not diseased even though he be so greatly different from the average of his group.

The second question which we propounded to ourselves was concerning the effect of our class procedure and our discussion upon the children themselves. On the one hand we spoke about the result of observing certain conditions as shown in the child's gain, at the same time that another child who had observed those conditions, failed to gain. Taking for granted that the children have some ability at analysis and judgment, it is inevitable that their inference is that it is largely a matter of chance whether one makes progress and that the observance of these conditions then becomes a matter of preference;—they may or they may not gain. On the other hand we have children who are consistently failing to make progress greater than the expected rate and who are honestly endeavoring to do all that is required of them.

We hold up before them the record of a failure. The child sees his normal weight line shown far, far above his actual weight line and week after week goes by in which he sees no progress being made in decreasing the distance between the two lines. The psychology of success is as applicable here as it is in any other situation. The accomplishment of a purpose is a stimulus to a greater effort. Constant failure on the other hand leads to indifference and lack of effort. The psychology of failure is as significant as the psychology of success. Persistent failure develops lack of confidence and makes for the cessation of all effort.

We are therefore faced with the problem in our nutrition classes of deciding on causal factors. We must know the amount of food necessary not only to maintain life, but also to supply the energy which is used up in various life activities. We would also have to consider the effect of various physical defects and living conditions on the child's nutrition. Obviously it would be desirable to be free from all physical defects, but there are probably some which interfere but little ,if at all, with the nutritive processes. It is highly probable that diseased tonsils are detrimental in nutrition. It is extremely improbable that such physical defects as Darwinian tubercle or a supernumerary finger would have anything to do with nutrition. An evaluation, however, of the influence of physical defects is highly desirable.

Not by any means is the psychological aspect the least important one. This we may consider under two heads: (a) the attitude of the child toward food, and (b) the emotional characteristics of the children and their associates. It has been clearly shown that the former of these factors is highly important. People have thought they were starving because the type of food taken had been changed, even though the caloric or nutrition value of the food taken was much greater than that of the food to which they were accustomed. In other words, one could " starve "[2] despite the fact that more nourishing food was provided.

These factors were not seriously considered in preparing a diet for our children and in many cases the only thought given in the preparation of a diet was to include certain forms of food which were deemed desirable or necessary in order to offer an all round food supply. It will be necessary in further experimentation to consider the psychological factors of prejudice and preference in order to be able to say definitely what the effect of more food is on the undernourished child.

In reference to the second fact, that of emotional conditions, it has been shown very clearly by experimentation that certain emotional factors, such as rage or fear, have a marked effect on nutrition processes. Cannon reports the cessation of the churning movements of the stomach when these feelings are aroused. These two emotions are dominant, but many other emotional characteristics such as irritation, jealousy, worry, envy and so on, are probably important even if not such great factors as either rage or fear. In order to answer this question we need extensive investigations of the influence of these conditions on digestion or the other nutritive processes.

Despite such conditions, we would strongly recommend the inauguration and the continuance of nutrition classes for health education. It may be that we are not able to solve the problem in this generation by this particular method, but certain results indicate the far-reaching effect of the procedure. The children who are thus being taught the desirability of regularity of habits and the necessity of eating proper food and the necessity of eliminating harmful stimulants, will undoubtedly influence the nutrition of the next generation. How well they will do this may be indicated by the following illustration: One of the boys in the class came to the instructor with the remark that he had been trying to persuade his mother that "an ounce of prevention is worth a pound of cure." The instructor did not get the significance of the comment at first and asked the boy what he had been trying to do. His reply was that he had been interested in the class work, he had been reading about nutrition and had come across this statement. He concluded, "I tried for two hours to show my mother what that meant, and at the end of the time she did not know a thing about it." If attempts at the education of parents are made in this way, what may we not hope for in the education of children? We may not cure malnutrition by education, but we can develop habits and methods of living which will have a decided influence for good with our next generation.

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[2] See Baylis, The Physiology of Food.

MENTAL ABILITY OF UNDERNOURISHED CHILDREN.[3]

Some experiments seem to demonstrate that the undernourished child is less fit mentally than other children. He has been supposed to be less able to make progress in school subjects and to be less alert in adapting himself to the requirements of new situations. In order to test the validity of these conclusions we decided to experiment with our nutrition class children.

Our work had two parts: (a) the study of the emotional characteristics, particularly as they were shown in the home situation so that we might see if certain emotional characteristics were associated, if not definitely causal factors, in undernourishment; (b) a careful measurement of mental and physical qualities so that we might know in what way and to what extent the children in the nutrition classes differed from wellnourished children.

In order to make an interpretation of our results possible, we decided to work with a "control" group. We, therefore, selected those children in the remaining portions of the fifth grade classes who were nearest the average weight for their height. We found thirty-five children whose variation was not greater than three per cent.

The tests were both individual and group and consisted of the following: *Individual* 1. Rapidity of Movement or Tapping, 2 Control of Movement or Steadiness, 3. Strength of Grip or Dynamometer, 4. Dearborn Reconstruction Form Board, 5. Knox Cubes, 6. Memory Span, 7. Free Association. *Group* 1. Trabue Completion, 2. Following Directions, 3. Cancellation.

The selection of these tests was determined by two considerations, first we wished to get a measure of the pupil's mental and physical endurance together with an indication of his ability to adapt himself to various situations, and second, we wished to have a group of tests in which it might be possible to get a second result after a period of approximately six months without the factor of practice or learning having too great an influence.

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[3] The experimental work was carried on by Dr. B. J. Johnson, but she is not to be held responsible for any errors or the interpretation of results.

Rapidity of Movement. The apparatus used for this experiment was the "tapping board" described by Whipple in his manual of mental and physical tests.

The score used in tabluating the results of this test was the total number of taps for forty-five seconds. These were divided into three periods of fifteen seconds each. The time was limited to forty-five seconds because in comparing results of a longer record, the third fifteen-second period shows little variation from the fourth or fifth fifteen-second period.

The results are shown in Table VIII.

TABLE VIII

TAPPING

		Nutrition		Control	
		First Trial	Second Trial	First Trial	Second Trial
Right Hand	1st period	79.2	82.2	81.8	83.6
" "	3rd "	68.5	68.6	72.1	69.2
Left Hand	1st "	71.1	72.7	70.3	74.1
" "	3rd "	60.9	64.7	59.8	61.4

The nutrition group on the first trial made a score of 79.2 in the first period and 68.5 in the third period. The control group is slightly superior, but the decrease in the third period does not differ greatly for the two groups. In the same way for the left hand there is but little difference in the groups, and the decrease in efficiency in the third period is almost the same.

In the second trial both groups are slightly superior to the first trial in the first 15-second periods. There is not so much difference between the scores for the two groups, and their decrease in efficiency during the 45-second period is almost the same. The remaining figures in this table showing the results for the left hand are in every case less than those for the right hand in the corresponding trial, but do not show any significant features.

From the standpoint of rapidity of voluntary movement it cannot be said that the undernourished children are either better or worse than the so-called wellnourished children. In five out of the eight results, the control group gives a slightly better record whereas in three of the results the nutrition group is superior. The predominance of one group over the other is not sufficient to warrant any conclusion of superiority either in ordinary capacity, in resistance to fatigue or in rate of improvement.

Steadiness Test. The apparatus used was the Dunlap Model of the Steadiness Tester, the construction of which makes it possible to have each hole in the same relative position to the subject's arm for each test. The scoring was done by taking the number of the hole in which the subject made more than 12 contacts. Since the holes were numbered from one to ten in the order of decreasing size, the poorer the result the smaller will be the score. In tabulating the results no account was taken of the number of contacts the child made on any particular hole until this number exceeded twelve.

Some variation is shown in the two groups; the control group having a considerably larger number of children making a score of four or less, with both right and left hand. The average scores, however, for the two groups do not differ much. For the nutrition group they are 5.0 and 3.6 for the right and left hand respectively, while for the control group they are 4.2 and 3.2.

In the second trial made at the end of the nutrition class period, the average scores are practically identical for the two groups. With the right hand the scores are 4.6 and 4.7 for the nutrition and control groups respectively, and for the left hand they are 3.5 and 3.6. These differences are shown in Table IX.

TABLE IX

STEADINESS

	Nutrition		Control	
	First Trial	Second Trial	First Trial	Second Trial
Right Hand	5.0	4.6	4.2	4.7
Left Hand	3.6	3.5	3.2	3.6

From these results one would say that the improvement of the control group during the period of the experiment was greater than that of the nutrition group. As an actual fact the nutrition group falls back slightly in the second trial. The scores for the right hand being 5.0 and 4.6 in the first and second trials respectively, while for the left hand they were 3.6 and 3.5. On the other hand the control group shows a slight difference going up from 4.2 to 4.7 for the right hand and 3.2 to 3.6 for the left hand. One is led to the tentative conclusion that the wellnourished children are capable of better progress than the undernourished. A serious obstacle to the acceptance of this conclusion lies in the wide variation shown by individual children. Some of those who made high scores in the first test, made very low scores in the second, while others who had made low scores in the first, increased considerably in the second.

One of the interesting features of this test is the number of children who make a score of zero. With the right hand in the first trial not one child fails entirely. With the left hand three of the nutrition group and six of the control group fail on the first hole. In the second trial two children of the nutrition group have fallen down so much that their score is zero for the right hand. With the left hand the number of children in the nutrition group making a score of zero is the same as in the first trial, but only half the number of children in the control group make a score of zero with the left hand.

Dynamometer Test. The improved form of the Smedley Dynamometer was used. Ten trials with each hand were recorded, a brief pause sufficient to read the scale being allowed between each trial.

The average results for each of the 10 trials for the first experiment with the right hand do not vary materially. In four out of the 10 trials the score for the nutrition group is lower than for the control group. In the ninth trial the score for the control group is very much better than that for the nutrition. The average scores, however, for all 10 trials are identical for the two groups. With the left hand the control group is, with one exception, better than the nutrition. The average score in this case is 15.2 for the nutrition group and 15.6 for the control. In the second experiment at the end of the nutrition class period, the control group shows a more marked superiority, but both groups give a record which is inferior to that of the first trial. For the right hand two curves showing the results are almost parallel, that for the nutrition group being always lower than the one for the control group. The scores in this trial are 15.2 and 15.8 for the nutrition and control groups respectively, while in the first trial each group had an average score of 16.8. The scores for the left hand show a smaller dropping off from that of the first trial, the averages being 14.4 and 14.8 as compared to 15.2 and 15.6.

For the right hand in the first experiment curves of distribution almost coincide. For the left hand there is less similarity. The average scores do not differ much, but the difference in distribution is quite marked. In the second experiment average scores have a similar relationship but the distribution with the right hand is from 11 to 24 with the majority of the nutrition group ranging from 13-16, whereas in the control group the majority lies between 14.18. With the left hand the range is greater, but central tendencies are more clearly defined.

Fatigue effects may be seen by comparing the average of the first five trials with that of the last five. For the control group in the first experiment these are 17.3 and 16.2 respectively, while for the nutrition group they are 17.6 and 15.9 with the right hand. For the first five trials with the left hand the scores are 16.1 and 16.5 for the nutrition and control groups respectively, and for the second five trials 14.3 and 14.8. In the second experiment there is a greater divergence in the two groups, but the average scores are not so markedly different. For the nutrition group for the first five trials and the second five trials the average scores are 15.8 and 14.6, while for the control group they are 16.3 and 15.2. With the left hand the scores are 14.9 and 13.8 for the nutrition group and 15.4 and 14.2 for the control group.

TABLE X

DYNAMOMETER

	Nutrition		Control	
	First Experiment	Second Experiment	First Experiment	Second Experiment
Right Hand	16.8	15.2	16.8	15.8
Left Hand	15.2	14.4	15.6	14.8
Right Hand 1st 5 trials	17.6	15.8	17.3	16.3
Right Hand 2nd 5 trials	15.9	14.6	16.2	15.2
Left Hand 1st 5 trials	16.1	14.9	16.5	15.4
Left Hand 2nd 5 trials	14.3	13.8	14.8	14.2

These numbers are collected in Table X so that a direct comparison is possible. In the 12 results given, for the two groups they are equal once. In only one case does the nutrition group give a result superior to that of the control. In ten cases the control gives the better record. From this it seems possible to conclude that as far as the qualities and capacities tested here are concerned the control group is superior.

The number of times in which the result for the second experiment is poorer than for the first is exactly 12. An explanation for this condition is highly desirable. We have considered the possibility of the child's attitude, but have found no satisfactory answer. In every case the children seemed interested and anxious to exert the maximal effort. There was no evidence of indifference or fatigue. They were as anxious to make a good record in the second experiment as they had been in the first.

The influence of the attitude of the examiner has also been considered. It may be that we assume that the child understands the necessity for doing his best as a result of the instructions given in the first experiment. This does not seem a satisfactory explanation, but until we are more familiar with the effect of attitude upon a performance, it is not possible to entirely eliminate this hypothesis. The effect of a greeting, an expression or an intonation must be considered before we can evaluate the effect of the experimenter's attitude.

Dearborn Reconstruction Tests. The form board in this experiment was described by Dearborn, Anderson and Christianson in the Journal of Educational Psychology for October, 1916. The score used is the time required to complete the performance, 360 seconds being the maximum allowed. In the first experiment 12 of the nutrition group and eight of the control group failed. The distribution of the remaining children shows wide variation ranging from periods less than 60 seconds to periods over 330 seconds, with the children almost equally distributed in the various periods. The average time for the two groups, eliminating the children who failed, was 139 seconds for the nutrition and 144 seconds for the control group.

Some improvement is shown in the results for the second experiment, in so far as the number of failures is concerned. Seven in each group failed on this second attempt. The distribution shows a more marked central tendency, the curves approximating normal distributions. The average time for both groups is greater than in the former experiment, being 163 seconds and 153 seconds for nutrition and control classes respectively. No decision can be reached concerning the relative merits of the two groups since the average scores differ so little and the number of failures does not indicate any marked difference.

Knox Cubes. The procedure for this experiment was that recommended by Pintner and Patterson. The results for the two groups are nearly alike although for the second experiment the nutrition class has a very large number of children making the same score. In the first experiment the average score for the two groups is 7.4 and 7.8, the control group being superior. In the second, the control group is again superior, the scores being 6.4 and 6.8. Besides the greater number of children in the nutrition class who make the same score in the second trial, certain other variations are noted. The distribution extends over a wider range of scores, three of the children in the two groups for the second trial making a lower score than that made by any child in the first. On the other hand, one child makes a score of 11 and none had made a score higher than 10 on the first. As far as the standing of the two groups is concerned the children of the control class seem slightly superior.

Memory Span. The material for this test were series of digits, two trials being allowed for each series of from four to ten numbers. The memory span was the longest series on which a child succeeded on one of the two trials given, and previous to which he had not failed on both trials of any series. The nutrition group is slightly superior in the first experiment, the average score being 6.5, while that of the control group was 5.9. In the second, they are much more nearly alike, the score of the nutrition group decreasing to 6.3, while that of the control group increased to 6.2. The results indicate a slight superiority of the nutrition class children.

Free Association. The stimulus words were selected for the Association Test with the purpose of bringing out instinctive tendencies and general environmental influences. Words that had been used by other experimenters thus offering some standard of comparison, were given the preference. The lists used contained 49 words of which 14 are found in the Kent-Rosanoff list, two in the Woodrow & Lowell additions to this list and six in Jung's list of 100 words. Exact responses were recorded. In case the subject said, "I don't know," failure was recorded.

Tabulations made in this test include the frequency of response, the number of rhyming words, the number of meaningless words, the number of repetitions of stimuli, the time for the reaction to the different words, the time of the reaction for the five longest delayed responses, the number of individual responses and the average time of reaction per child. With our limited number of cases it turned out that no conclusion could be derived from most of these tabulations. The scattering of responses and various other factors made many of them of little value.

The average reaction time shows a decided difference in the two groups. The time for the nutrition children is considerably shorter than for the control group, being 2.7 as compared with 3.2 seconds. For the second experiment, the general results are not so dissimilar, but the relation of the two groups as far as the average time is concerned, is almost identical. For the nutrition group the average time is 2.5 seconds, while for the control group, it is 3.0 seconds.

Certain progress is shown in these results. The children are keener and more ready for response at the time of the second experiment than they were at the first. The difference being only 0.2 seconds on the average, we are not justified in considering it of great value. Less than a 10 per cent decrease in time, considering the number of children, is not of great significance.

Trabue Completion Scales. Scales B and D, which are described by the author in the publication entitled, "Completion Test Language Scales," were used for this experiment.

In the first experiment the children do not show a very great difference, although one child in the control group scores zero and another child makes a score of only three. With this exception the distributions do not diverge materially. The average score for the control group is greatly influenced by the score made by the two exceptional children: it is only 8.8, whereas the average for the nutrition class is 9.1.

In the second experiment the divergence is considerably greater. In this case no child makes a score of less than six, but the number of the control group making the smaller scores is greater than the number in the nutrition class. The difference is shown in the average score which for the control group is only 8.9, while for the nutrition class, it is 11.0.

Since the results for the nutrition class are superior in both instances, it would seem justifiable to conclude that these undernourished children have made better progress in their school work and have more intelligence than the wellnourished children. The fact that the improvement of the nutrition children is greater than that of the control class might indicate that their intelligence is better, that they profit more by school training and have derived greater benefit from the year's work.

Following Directions. The material was devised for this particular purpose, some of it being modifications of earlier Directions tests. Using an "all or none" method of scoring, the results for the first experiment show variability in performance, the record for the nutrition group being slightly better than that for the control class. The superiority is also shown in the average score, which is 3.5 for the former and 2.9 for the latter.

By the time the class period was over, the nutrition children apparently had made no progress, their average score being identical with that of the former experiment. The children in the control group had made material progress, the average score increasing to 3.7.

Judging from the results in the first experiment, the undernourished children are better, but during the year they make no progress, whereas the children in the control group make such progress that they excel those of the nutrition class. From these conditions it is impossible to make any conclusions as to the superiority of one or the other group.

Cancellation: The material for this test was also devised for use in this experiment. There were ten questions, the words of which were arranged in an irregular way, so that the subject had to rearrange them in order to form a question. He was then requested to check the correct answer in terms of yes or no. The number of questions correctly answered, omissions being counted as errors, was used as the score. According to these results, the nutrition group is superior, the average score being 7.4, while for the control group it is only 6.1. The superiority shows itself, also in the second experiment, although the distributions are not so clearly different. It is shown in the average scores, which are 6.5 for the nutrition group and only 5.8 for the control group.

The lower score in the second experiment is again a prominent feature. The nutrition class maintains its superiority, but has decreased somewhat more than the control group. It remains, however, at a higher point of efficiency than was reached by the control group in the first experiment.

The numerical results for the last seven tests are collected in Table XI.

TABLE XI

	Nutrition		Control	
	First Trial	Second Trial	First Trial	Second Trial
Dearborn Reconstruction	139	163	144	153
Knox Cubes	7.4	6.4	7.8	6.8
Memory Span	6.5	6.3	5.9	6.2
Association	2.7	2.5	3.2	3.0
Trabue Completion	9.1	11.0	8.8	8.9
Directions	3.5	3.5	2.9	3.7
Cancellation	7.4	6.5	6.1	5.8

From these results it seems impossible to conclude that there is a marked difference between the two groups. We cannot say that undernourished children are as capable as better nourished children, neither can we affirm the reverse.

One of the conditions which we must remember in drawing conclusions from these results is the condition of the children included in the two groups. We must remember that 39 children who were in the nutrition class group had made great progress by the time the first nutrition classes were held, at which time the psychological testing began. We have at the same time to remember that the children of the control group, who at the beginning of the experiment were within three per cent of the average weight for their height, varied considerably before the expiration of the year.

In going over the individual records we find that the children who were most undernourished as determined by the height-weight index have made among the best records for both groups.

In formulating the program and deciding on the series of tests to use we aimed to secure a measure of the relative improvement of the two groups of children and also to have a group of tests where practice with that particular test would be a negligible factor.

It would seem that if we had fulfilled our conditions there should be a slight increase in the performance ability of the pupils, which would be in some way a measure of the improvement expected during a period of six months.

The contradictory results in a number of these cases lead us to serious considerations concerning the factors determining them. A number of these might be mentioned. We have first the attitude of the children in working with approximately the same material which they had tried six months before. It does not seem that this is a valid hypothesis since the experience of many investigators has been that the interest of the children in these performance tests is not decreased on a second attempt. They come to the performance with as keen an interest in the experiment as they had at the first time.

A second hypothesis to account for these results would be that our tests are not of equivalent value. It does not seem possible to accept this hypothesis because of the fact that in many cases the material is identical and in other cases the two sets of material have been given to similar groups of children and have given almost identical results.

Another hypothetical explanation is that the unconscious attitude of the examiner influences the child's performance. Having gone over the experiment once with the child, one might think that the problem had been presented in exactly the same way. The influence of the past experience, however, may dominate to such an extent that unconsciously one fails to inspire the same enthusiasm or generate the same energy as in the first experiment. Before accepting this hypothesis, it will be necessary to investigate at length the effectiveness of an examiner's attitude on the emotional drive which determines a child's performance. It will be necessary to know the effect of an intonation or a facial expression.

A final hypothesis might be that these children had less vitality owing to the effects of the year's school work. This would argue that the strain of the school work was too great for any of the children of the school. It would not simply mean that the strain was too great for the undernourished child, but it would also mean that it was too great for the normal average-weight child, since the children of the control group show a result quite similar to that obtained from the nutrition class children. If such an hypothesis is open to consideration it is obviously necessary to study our children more closely. A school procedure should be devised which would permit a healthy progress so that at the end of the school period the child may go on to other activities, well equipped physically for the strains which will be placed upon him.

One fact stands out clearly. It is that we are in approximately the same condition in respect to the problem of the mental development of undernourished children as we are in considering the causal factors in undernourishment. A frank confession of ignorance is all that we are able to to make. We do not know why many children fail to gain in weight, neither do we know that between the failure to gain in weight and school progress is there any clear cut connection. It may be that biological variations shown in decreased weight may be compensated for by greater ability and adaptation, i. e., by greater readiness of response to the stimuli of new situations. An answer to these questions will require much more extended and at the same time intensive investigation.

EMOTIONAL CHARACTERISTICS

In formulating a study of these children it seemed desirable to consider emotional characteristics and habit reactions. We did not plan to formulate a routine experimental technique from the results of which conclusions might be drawn. What we planned to do was to study the child in the environment of the class room, of the street, and of his home. Unfortunately the carrying out of this plan was seriously interfered with by rearrangements in our own program. It was impossible to observe much that we had hoped to observe as to these particulars.

Certain characteristics indicative of the neurotic instability were noted in a number of children and the proportion in the nutrition class who showed these characteristics was slightly greater than in the control class. The difference was not sufficient to enable us to draw any conclusion as to the specific effects of this neurotic instability on nutritional processes. On the other hand, in our discussion of the child whose record was shown in Chart 11, we spoke of a neurotic instability in which one of the chief characteristics seemed to be an increased basal metabolism. This means that for the carrying on of the simple automatic functions of living a greater supply of nourishment is necessary.

Not only is the digestion of a certain amount of food necessary for proper nourishment, but there is also a necessity for it being taken under proper conditions, with desirable emotional attitudes and in certain ways. It has been shown that disturbances in the emotional life of animals resulted in a disturbance of certain nutritional processes. In making a comparative study of these two groups of children it would be necessary to carry on a considerably more intensive investigation than has so far been possible. We found certain conditions which seemed to bear out the general hypothesis that an emotional disturbance is a causal factor in undernourishment. We do not mean to say that the emotional disturbance actually changed the processes which are necessary for satisfactory digestion. It may only be that the emotional disturbance results in a failure of desire to take sufficient nourishment. With the lack of sufficient nourishment, a decrease in weight would almost necessarily result.

The promotion period in the school gave considerable information concerning these factors. At that time the children in the classes showed an actual loss in weight, while both previous to and following the promotion period a marked increase was recorded. This loss in weight might be due to excessive expenditure of energy during that period, but it is quite possible and indeed probable, that it was due to the worry or other emotional disturbance which influenced the child's desire to take food.

Frankness on the part of our children as well as on the part of parents would enable us to make a much more satisfactory study of the influence of these factors. The desire to conceal quarrels or antagonisms has been pretty thoroughly drilled into all of us, especially when these antagonisms are between members of one family. It has been left to the insight of the social investigator to determine how far there was sympathetic co-operation among the members of the family group. In many cases there was co-operation, but it was not necessarily the type which involves an understanding of the child by the parents or of the parents by the child. The parents were usually willing to furnish food of the right kind and at the right time. They were also willing to make rearrangements in the living conditions and to take what steps were necessary to improve the child's physical condition. They were, however, not quite so alert to the importance of maintaining a happy and tranquil disposition. Continual faultfinding or criticism may arouse in the child an antagonism which would militate against a desirable progress. While it is impossible to present statistical information of the effect of this attitude, it seems certain that in a number of our cases, such an attitude prevented the effects of the nutrition class instructions being as marked as they might otherwise have been.

ALIAS HYGIENE[1]

T. A. Storey, Executive Secretary Interdepartmental Social Hygiene Board, Washington, D. C.

Hygiene " is an ancient art. Some of its most important precepts formed a part of the wisdom of the Egyptians . . ." thirty-five hundred years ago. Hippocrates wrote a " treatise on airs, waters, and places " over twenty-three hundred years ago and recorded in perpetuity certain valuable information that was even then a thousand years old. Over seven hundred years ago the Code of Health from the School of Salernum (1200 A. D.) assembled many facts on hygiene that are in harmony with modern scientific information. The Code passed through more than 200 editions and " For over two hundred years it appears to have been the most popular book in existence."

Since Hygia, the Goddess of the preservation of health, was worshipped in the temples of her husband or father, Aesculapius, in that wonderful era of hellenic civilization which the later modern world has failed in so many respects to surpass or even equal, there has come into the affairs of mankind an increasingly large number of discoveries and applications that relate to hygiene. One might say that Hygia has now so many children that she does not know them all or that the religion of Hygia has broken up into many sects that know each other not. For today the world has many arts and sciences that have an unrecognized or unappreciated relationship with hygiene. The multiplication of the sub-divisions of hygiene with their scientific bases, their dramatic importances and their far-reaching influences on the economic and social life of the people has obscured the great conception of antiquity. Today the average individual thinks of hygiene as a matter of cleaning his fingernails, washing his face or shampooing his scalp. Such health achieving and health preserving enterprises as eugenics, prenatal care, care of the baby, child hygiene, medical inspection, play, athletics, physical training, safety-first, medicine, surgery, dentistry, nursing, the feeding of an army and the recreation of a camp are not ordinarily recognized as aliases of hygiene.

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[1] Presented before the American Child Hygiene Association, Section on School Age and Adolescence, Asheville, N. C., November 11, 1919.

Hygiene is the science and the art of the preservation of health. The sciences of hygiene are those sources of information from which we secure accurate data as to the agents that injure health, the contributory causes of poor health, the carriers of disease, the defenses of health and the producers of health.

The arts of Hygiene are concerned with the applications of the sciences of hygiene to the health needs of the individual, to the health needs of groups of interdependent individuals and to the health needs of associations of interdependent groups.

I need cite only a few examples to recall to you convincingly the ramifications of the scientific sources, and the practical applications of hygiene.

Between 35,000 and 75,000 persons lose their lives every year because of accidents. These accidental deaths are largely due to mechanical, physical or chemical causes. The mechanial, physical and chemical injuries of war are still fresh in our memories. Hygiene must include a consideration of the mechanical, physical and chemical agents that injure health.

The pathogenicity of certain bacterial, certain protozoan and certain higher animal parasites has opened a large field for a great variety of scientific investigations relative to the living agents that injure health.

The history of the Jukes and of the Kallikack families establishes heredity as a very important division of hygiene.

The relation of physiology to hygiene is obvious. As a matter of fact normal health is a product of normal physiology and abnormal health is a product of disturbed physiology.

The fact that there are approximately 75,000 deaths from cancer annually in this country and that there were over 6,000,000 deaths from influenza last Fall in all countries and the fact that we know very little about the cause or the transmission of either of these diseases indicates that there are important fields of scientific research in hygiene that are as yet undeveloped and perhaps as yet not even identified.

The influence of the economic and social status upon health is obvious. Money can buy a certain amount of health. The individual, the family and the community that has resource and uses it wisely can buy protection from disease and can provide for effective constructive hygiene.

Our rather recently acquired knowledge of disease carriers —insects, animals and humans—has added some tremendously important scientific information to general hygiene and opened up great fields for research. I need only remind you of such insects as the mosquito, the flea, the fly and the body louse and you will immediately recall their relationship to disease. Only the most painstaking and varied entomological investigations have made it possible for us to understand the part these carriers play in the dissemination of disease and have made it possible for us to develop defenses against them.

Along with our greatly increased information concerning the scientific, economic and sociologic facts of hygiene, there has come also a much larger variety of conditions for the applications of those facts for the acquisition, conservation and defense of human health.

While our expertly qualified agencies are searching for further truth from the sciences of general hygiene, other agencies are engaged in distributing the information that we already have for the better information and education of our people.

We have agencies that are working to reach the individual in order to educate and inform him concerning protective hygiene, preventive hygiene, remedial hygiene and constructive hygiene.

Other agencies are engaged with the group for the purpose of informing and educating the home group, the school group, the occupation group, and the great public institutional group. And still other agencies are concerned with intergroup hygiene in the rural community, the village, the city, the county, the state and the nation.

This organization, The American Child Hygiene Association, contacts all these phases of hygiene. It must be concerned with the acquisition of a greater amount and more accurate information concerning the agents that injure health, contributory causes of poor health, carriers of disease, the defenses of health, and the producers of health.

It must be concerned with the education and information of the individual. It must be concerned with the hygiene of the home, the school, the factory and the institution. It must be concerned with the hygiene of the rural, city, state and national communities. It seems to me self-evident that our greatest progress in health will come when the interrelations of the thousand and one agencies in hygiene are recognized and brought into an active team cooperation. This section on School Age and Adolescence has much in its field that is intimately in common with the organizations that are concerned with mental hygiene, eugenics, prenatal care, the hygiene of childbirth, the hygiene of infancy, provisions for play and recreation, medical inspection, physical training, athletics, school hygiene, domestic, family or home hygiene, industrial or occupational hygiene, institutional hygiene, rural hygiene, city hygiene, state hygiene and national hygiene.

Thirteen states have enacted laws, more or less satisfactory, on physical training for their public schools. The work of this section is essentially the same as that covered by a modern program in physical training. There is a national agency in the field that is concerned with influencing other states to enact laws requiring physical training in the schools. The object of that organization and the object of this organization are identical.

There is a powerful campaign on now for the suppression of prostitution. I saw a record the other day of a little girl, who, at the age of 13 years, had spent two years of her life as a commercial prostitute. There are states in this country in which the age of consent is as low as 14 years. These are problems of School Age and Adolescence.

We have a national organization that is engaged in improving the instruction of teachers, another one that is concerned with better training of teachers of physical education. Both of them need all the support you can give them—and you need all the success they can achieve.

We have various governmental agencies that under different names are concerned with hygiene; one of those agencies, The United States Interdepartmental Social Hygiene Board, is organizing and applying its governmentally derived powers for the vigorous and co-operative emphasis of the tremendously important fact that hygiene, in its composite structure—with all its aliases—carries a resource in health information, health education, health defense, health conservation, and health acquisition that is competent to increase enormously man power and woman power, the most precious assets of a nation.

It would be easy to multiply references to good players that should be on a powerful, and as yet unorganized, national hygiene team; if it were possible to organize the plays, formulate the signals and perfect the team, there could be no such thing as defeat.

NUMBERS, TIME AND SPACE IN THE FIRST FIVE YEARS OF A CHILD'S LIFE

By Sophie Ravitch Altshiller Court

Introduction

Are children below school age interested in counting, measuring, computation, etc.? If so, when does the interest begin? How does the conception of time and space develop? What stimulates these interests and this development, and which are the factors that are unfavorable?

The following is an account of the development of one child's conceptions of numbers, space and time from the age of twenty months up to the age of five years.

The child in question, A., is a boy and an only child. This latter circumstance gave him many lonely moments, but much fewer than would be expected. In order to meet his need for companionship, playmates have been encouraged to come to his house since he was two years old, and he was often allowed to go to them; he has had much out-door free play with neighbor children, and, beginning with the age of three years and four months, he was always a member of one kindergarten group or another, organized for him by his mother.

He was born and always lived in University communities, and the surroundings were those of a small town, encouraging quiet contemplation, concentration of thought and close observation.

His health has been perfect, except for a severe illness at the age of four and a half, after which he recovered remarkably well and regained his former vigor much sooner than would have been expected.

A. is lively and active, but never boisterous or daring, and never delighted in strenuous physical exercise. He is cautious and undertakes only what he knows he can do well.

This latter feature may indicate a mathematical mind, the more so, that from babyhood he seems to have been a lover of exactness.

But he also shows unmistakable linguistic abilities: he speaks almost perfect English, eagerly and easily learning new words and expressions. Since the age of two and a half he has had a remarkably rich vocabulary and seems to have an instinctive appreciation of grammatical forms. At the age of three years and five months he became spontaneously interested in word-study of his own, and at the same time discovered the division of words into syllables and showed some notion of separate sounds incorporated into words. Since then he has always been interested in analyzing words into syllables and into sounds, and other phonetic "games." He has a splendid memory and memorizes verses—even long ones—from only hearing them a few times; at the age of three and a half he was able to recite three pages of rather difficult prose after having heard it several times. He has had an opportunity to hear several foreign words, and at once made them his own, with a fairly good pronunciation.

He may have inherited both—mathematical and linguistic abilities. His father is a mathematician and also knows several languages well. His mother is a linguist.

A. is quite a thinker for his age; the questions he asks really interest him, and he insists on being answered satisfactorily, listens to the answer attentively, remembers and discusses it. His insistent questions often embarass his parents, and more than once have compelled them to explain to him things, which they never expected to discuss with him until the age of eight or ten. Thus, I was obliged to tell him about the shape of the earth when he was four years nine months old.

Therefore, though he seems to have mathematical abilities, they are not sufficiently pronounced to classify him as a "mathematical mind." He may be rather put into the class of "bright children," of which there are recently so many, especially in families of intellectuals. At the age of three years four months he was given the Binet test and showed the intelligence of a child of four years eight months, an IQ of 135.

Probably, a very important factor in A.'s development is his mother's pedagogical experience.

His mother is a teacher by profession and by inclination. She has taught both individual students and large classes, and has at different times had pupils of both sexes and all ages, from kindergarten children up to college classes and grown-up illiterates. Her main experience has been in teaching languages.

Ever since he began to talk, A. showed immense interest in numbers, later in measuring both time and space. He always delighted in counting, and whenever there was any danger of his becoming impatient with the process of combing his curls, or dressing him, he would be kept quiet by either a story, or a verse, or "counting."

As soon as his interest in numbers became apparent, much attention was given to his efforts in this direction, and help, when asked for directly, or when the need of it was evident, came forth abundantly and willingly. Often his attention was called to the numbers of blocks picked out for construction, to the number of plates at dinner, etc. But he was never forced to count, and every new step in his arithmetical development was undertaken by him without any outside stimulus.

Thus, though encouragement was never lacking, whatever A. learned in regard to numbers, space and time measurement, was practically self-taught. Up to the age of four years eight months he never had any lessons in arithmetic. In the four successive kindergarten groups (Fall 1917, Winter 1918, Fall 1918, Winter 1919—ages three years four months to four years ten and a half months) the main parts of the program were manual training, games, music, stories, and nature study; whatever number work there was, was below his level.

I. THE GROWTH OF A.'S NOTION OF NUMBERS

A. *Up to the Age of Two*

A. began his intimacy with numbers by using "two" before he ever used "one."

At the age of twenty months he used to point out objects, name them, then immediately look around for their mates, and shout out with glee: "two;" "lamp—two lamps!"; "train—two trains!". At that time he ignored anything beyond "two" altogether.

At first his "two" appeared separately, without the noun. When we would say to him: "see, a flower!"—he would find another one, and say "two." It may have meant "too" then. But within a few days he began to add the noun, in plural form.

It is necessary to remark here, that we have never taught him to speak, i. e., never made him repeat words after us.

B. *His Third Year*

I do not know precisely, when "one" appeared for the first time. But at the age of two years he used "one" and "two." "Two" then meant anything above "one." Thus, when seeing shoes in a show-window, he exclaimed: "two shoes!"

At the age of two years eight months he could count from one to ten (merely naming numbers in their successive order). Nobody taught him this in the sense of forcing his attention or making him repeat it. But we amused him often with nursery rhymes and finger plays, among which were also those with numbers, and he learned the successive order of the first ten numbers from hearing it only.

At the same time (age two years eight months), if shown some beads, marbles, spoons, blocks, or anything else, and asked "how many?" he would answer correctly only "one" and "two." Any number beyond two was "many."

A month later he showed familiarity with "three," recognizing three objects at a glance. "Many" became relegated to the region beyond three.

C. *His Fourth Year*

At three years A. counted (named numbers in their successive order) to twelve, sometimes skipping ten.

He knew one, two, three, four, i. e., could recognize four small objects at a glance, understood which number (within four) is "more" and which is "less," and knew that if you have two and want four, you must get some more, while if you have four and want three, you must take away one.

He could then count objects within six.

He liked to count and to talk about numbers, but never was shown figures as yet—not until the age of four.

Beginning with the age of three he was greatly amused by little problems like this: "there is one nest on the top of a tree and one nest on a lower branch. How many nests do you think can we find on that tree?" He would then make a "nest" with each of his little hands, would place them one above the other, and would find the answer. Of course, his hands then were not counters, not symbols,—they were the nests.

Or I would ask: "you have three marbles, and Bryce has two; who has more?" And the answer would come, after some meditation, in a triumphant little voice, and followed by laughter of satisfaction. Sometimes, later, from the age of three and a half, he would ask us problems similar to those we asked him, and we would take turns in asking and solving problems. Most of the problems dealt with trains, in which he has been immensely interested since babyhood.

At the age of three years five months the following conversation was taken down:

(He was "selling" his blocks, which then represented watermelons.)

"Watermelons for sale; Wootermeelons for sale! Lady, do you want watermelons?"

"Give me three, please."

A. brings me three of his blocks.

"Oh, excuse me, I want four of them, not three."

"Shall I bring one more?"

"Well, I want four of them."

"All right, I'll bring one more."

And he does.

"Count, mamma, do you have four?"

I count, and we both find, that I have four "watermelons."

I call him back.

"May I ask you for five of them?"

"O, then I'll bring another one?"

"I don't know, I want five, that is all."

"All right, here is another one. Let me count them for you—let's see whether you have five."

He counts, and we find, that I have five "watermelons."

"But now I like them so much, I am sorry I asked for five, I want six."

"Six?" A. is perplexed. "You mean five, don't you?"

"No, I mean six."

"Shall I take away one?"

"I don't know. Try and see."

He tries. Counts the rest. "Four! Mamma, do you want four?"

"No, I want six."

He puts the one back again, counts, and finds five.

"Did you ask for five?"

"No, I asked for six."

He tries to put the blocks in different order. Counts—"five!"

Changes order again. Counts—"five!" Piles them up, one on top of the other. Counts them—"five!" Piles them up again, changing order. "Five again!"

"How many do you want, mamma?"

"I want six."

"I'll take away one; no, I'll take away two."

He does, counts the rest: "no, there are three now."

Puts the two back, counts: "Five! Do you want five, mamma?"

"No, I want six."

"O, I'll bring one more. Shall I?"

"Try."

He does, counts, and, triumphantly:

"Mamma, there are six now, I brought one more; count them, mamma."

I do, and we find six.

Then he goes on selling "wootermeelons."

Thus we see, that he was then familiar with numbers within five: he unhesitatingly brought one more block to make up the next highest number. But six was evidently a new number to him, though he could count (name numbers) to twelve.

When dealing with numbers within five, he knew that adding another block would change the number of blocks; yet it did not occur to him at first to try that, in order to obtain six. Taking away, piling up, arranging and rearranging the order—everything was tried before he thought of adding one.

The piling up and otherwise changing the order of the blocks was not a mere accidental device to make up a number: it was the logical conclusion of a mind whose conception of number is essentially concrete. To A. at that time six blocks meant definite blocks in a definite place, each one being a distinctly individual unit and occupying its own place. If you change the order, you may change the number.

A. had no conception of abstract numbers at that time; counting to twelve did not mean thinking of abstract numbers —or any numbers at all—but merely knowing some definite words in a definite successive order.

When taking away a block to make a smaller number, he would ask which one to take away, and would hesitate long, if the choice rested with him.

He could not at that time count twelve objects, above six he would point to the same block while naming two or three numbers, or would skip his finger quickly over several blocks, while naming only one number. But two weeks later, at three years five and a half months, he could count objects within eleven.

At three years seven months he counted well (named numbers) to 40, and counted objects to 30, after which he would get tired.

A month later he could count to 50—both naming numbers and counting objects.

At that time (three years eight months) he did addition and subtraction within five fairly well without counters, excellently with counters. But his counters were not yet mere instruments for counting. He used then for counters mostly fingers, beads and blocks. If he skipped one, or counted one twice, and his attention was called to the fact, he would invariably inquire—"which one?"— and would not be satisfied, could not understand, unless he knew which one he had skipped or counted twice. Each finger, bead, or block, was still an individual, not a symbol. Sometimes they represented birds, sheep, railroad cars, etc., but then it was: "play like the fingers are birds," and they were birds, but never symbols.

At three and a half he became interested in halves. Every time, when I cut an apple for him, he would watch me closely, compare the two parts (though he knew that both were for him), and study them. He would ask me to cut his slice of bread and butter into halves: " I want to see the halves." He discussed at length just where was the dividing line of the lower and upper halves of a cup; he would tear a sheet of paper in two and find out whether these were halves; and, very soon after he became interested in halves, he would not be satisfied, when, at his request, I cut a string into halves, if I would make one part a tenth of an inch longer than the other. Exactness was one of his pronounced characteristics since babyhood.

For about three months he was thus intensely interested in halves. Then he began to study quarters in the same way, with the same intense interest, with the same accuracy in measuring.

At three years nine months he used for the first time " first," " second," " third," and also " a pair of horses," " two pairs of horses "—correctly and intelligently.

The period between three years ten months and four years ten months was the period of his enthusiasm for dominoes. His father or I played with him. The game consisted in simply matching, but at first this was a slow process; he used to count the dots each time. Soon however he began to recognize the number of dots at a glance. After some two and a half months the game became too mechanical to be interesting, on account of his spontaneous recognition of the number of dots. We then began to play thus; we had to count dots on both sides of the domino block and match a block which had the same aggregate number of dots. He liked this for a while, and did pretty well, but never grew as enthusiastic over this game as he did over the first. Evidently we made a mistake in introducing it too early. Gradually the dominoes were abandoned.

D. *His Fifth Year*

At the age of four A. went for six weeks (June-July) to the first grade of the observation Summer School at the University of Oklahoma. He liked it very much. In number work he was far ahead of the curriculum, but learned there to recognize the figures 1, 2, 3, 4, 5.

Upon my request he was excluded from writing on account of his age; he tried it however upon his own request, once, but failed: the children began their writing lesson with their first names, and he could not make his pencil obey him to even make an O. He became discouraged, and did not try any more. Yet, he had used the pencil a great deal for scribbling, since he was about two years old. Pencil and crayons always were and remained his delight.

In August, some six weeks after his fourth birthday, he went on a long trip East, visited several cities, including New York City, rode on trains, sailed on a steamboat across Lake Erie, etc.

The new impressions crowded out his interest in numbers, and yet he applied his knowledge quite often, and even showed mental growth in this direction.

Thus, once, in Brooklyn, N. Y., when looking out of a window at a crowded Sunday street-car, he remarked, that there were almost as many people at that time on that car alone, as live in his home town altogether. Of course, this was a merely quantitative appreciation, not numerical, but it shows good arithmetical judgment.

He also tried to count above fifty, and, when we returned home in September (four years and three and a half months), he counted fairly well to 100. During the next three months he was very much interested in counting successive numbers, and learned to count to 1,000. At four and a half he counted well to 1,000 and had a very correct notion as to "which is more and which is less" within 1,000.

At that time, between the ages of four and four and a half, he especially delighted in counting. He would name the successive numbers one after another till he would be out of breath, then rest a while and go on counting, sometimes asking "where did I stop?" Up to 200, sometimes even farther, he would not be satisfied by counting by tens—he had to name all the numbers, one by one; then, when tired, he would go on counting by tens, and only seldom would he finish by the hundreds alone. Several times he actually counted to 1,000, one by one, with several intervals, during which he would do something else, for a change, and then return to counting, usually with the question "where did I stop?"

I discouraged this counting, not seeing any advantage in it, and fearing the strain. But evidently he obeyed his inner impulse, the need of a muscular and auditory interpretation of his consciousness of number and rhythm. It was a kind of a symbolic activity, and so elemental, that it surprised us, and defied our influence.

When, after 100, he attempted to learn to count more, he asked: "what comes after 100?" I said: "that is enough. Stop at 100, that is all." "Isn't there more? can't I count farther?" he insisted: "tell me, what comes after 100." I finally said: 101, and, of course, that was enough, he went on to 199.

I thought it strange, that so many times he gave evidence of understanding that there can be no limit to numbers, that you always can add one. Perhaps he simply felt the need to continue the pleasant rhythm, to go on with the fascinating succession of words. Since his auditory memory has always been excellent, he had no trouble in learning to count to twelve; as he grew older, he easily understood the system, on which the names of the numbers from twelve to a thousand are based, and the effort of counting was so small, that it was worthwhile for him to pursue the pleasure ad infinitum.

At the age of four and a half he passed through a severe illness, and was confined to bed for six weeks. During his convalescence his interest in numbers reappeared, but this time in figures only. He began to attempt to trace figures on his blanket with his finger and make us guess what they were. He looked into the paper his father was reading at his bedside, and, finding there figures, studied them, turned the paper around, and showed, that 6 becomes 9, while 8 remains the same. Yet, he did not know the figures well at that time though he had learned them partly on the clock (see below, development of the notion of time).

He was so intensely interested, that I brought him a calendar, consisting of 12 pages,—a page for each month. The dates were printed in black, except Saturdays, Sundays and holidays, which were in brown. The calendar proved a great success. Fearing that A. was straining his eyes ,and also thinking that he was doing too much mental work, I tried to take away the calendar after a while. But A. demanded it again and again. The calendar became the most cherished, the most interesting toy. A. invented a game: he read the numbers in black and made us read the ones in brown, and never grew tired of it, insisting on going over all 12 months at a sitting. Thus he learned to read figures up to 31, and soon, easily, by analogy, to 100.

At that time he did not care much to count without looking at figures, and absolutely refused to do any computation, to even listen to any little problems, in which he used to take such delight before. He was altogether absorbed in the study of the figures.

But, after having mastered the figures, he began to be more interested in computation. He again began to use his fingers in little problems, with the "play like" understanding. But at this stage the "play like" gradually became a mere form, and his fingers mere symbols. For instance, when there were apples in a problem, he would convert his fingers into apples. He would thus use fingers for any object mentioned in the problem. The ease and swiftness with which his fingers would be converted into different objects, one after another; the expression of his face, and the fact that he soon drifted into the next stage of abstraction, seem to prove, that "play like" was then only a device for solving a problem. The next stage of abstraction consisted in his counting on fingers only one of the numbers to be added: He would wave his hand and say: "I have three apples there; now, here are four more (his fingers); three (over there), four, five, etc. (pointing to his fingers). This was suggested by me, and accepted with such readiness, and even eagerness, that he certainly must have been ripe for it. (At a little over four and a half.)

At about the same time he began to talk about abstract numbers. Thus, he would announce, that two and three make five, or would ask: "how much is six and six?"—usually the doubling attracting his attention. He then liked to solve little problems, using fingers, beads, blocks, etc., as counters.

At the age of four years eight months he began to have every day a half-hour lesson, which, however, by his request, usually prolonged itself to an hour. A few minutes of these lessons were devoted each day to arithmetic. The lessons lasted five weeks (February 18, 1919, to March 25, 1919). He read numbers, counted by two's and by tens, and solved orally little problems within six. Beside number work he had manual training, free hand drawing and drawing of straight lines, and verses were read to him. These lessons were interrupted, because his fourth kindergarten had started.

He liked these lessons very much, and to miss a lesson was a punishment.

At the age of four years nine months A. became greatly interested in typewriting, as a play, without knowing anything about the letters, or concerning himself with them. Several times I volunteered to show him how to typewrite his name. He learned it easily, but without enthusiasm, and did not ask me for any more words, but continued to find delight in striking keys at random and seeing the result. Thereupon I left him alone, and he continued to enjoy the typewriter in his own way. But just before his fifth birthday he began to typewrite figures, sometimes in successive order to ten, sometimes at random, sometimes making up numbers above ten. Seeing his interest in this direction, I prepared for him typewritten columns of little additions within ten, thus:

1+1=	2+1=
1+2=	2+2=
1+3=	2+3=
etc.	

He typewrote the answers correctly and neatly, but soon found out, that he did not have to count, but to take successive numbers. Soon after this discovery I prepared for him problems within ten, where the answers were not in successive order:

1+1=
1+4=
1+2=

2+3=
2+1=
2+5=

He completed three columns once, without a single mistake, but did not attempt any more. Evidently, I made this time the same mistake that I had made before with the dominoes: I took the next step too soon.

At the age of five A. began to typewrite the letters, figures, and signs in some arbitrary order, and completed two or three pages of this kind of typewriting, e.g.:

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
@@@@@@@@@@@@@@@@@@@@@@@@@@
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
ssssssssssssssssssssssssssssssssssssssssssssssssssssssssss
$$$

He was then not at all concerned about the meaning of these symbols, and only seldom would he ask about some of them. For most he had his own names, as for instance T he called "the hanging down letter," and E, "the table."

About two weeks after his fifth birthday his interest in typewriting disappeared.

Discussion

There are several striking features in A.'s interest in numbers. The influence of the seasons is one of them. Every spring, for three or four weeks, he would refuse even to consider any suggestion of counting or solving problems. This influence of early spring was regularly repeated in 1917, 1918, and 1919, at the ages of two years nine months, three years nine months, and four years nine months. He would then be entirely taken up with outdoor play, would like to watch the awakening of nature, would dig and romp outdoors all day long. After the three or four weeks he would become interested in arithmetic again, but only at intervals, and not as intensely and wholeheartedly as usual. Throughout the Summer his interest in arithmetic has usually been at a low ebb. At times, suddenly, he would impart to me some of his arithmetical discoveries, even in Summer, but these were rare and short-lived flashes of inspiration. With the approach of Fall they would occur more and more often and would last longer. In late autumn and throughout the whole winter his interest in arithmetic is always strong and almost continual.

Another marked feature of his interest in numbers is, that it fastened itself on some phase of number work without any external influence. In all his career of a youthful student of arithmetic the choice of the particular subject was his, mostly to my surprise and even disapproval.

Thus, as the above account shows, at the age of three years five months he became intensely interested in counting above twelve, though we discouraged him. His insistence was so great, that in three months he counted well to fifty. Later on, at the age of four years three months, again by his own inquiries and through his own insistence, he learned to count to 100, and then, until four and a half, was fascinated by learning to count to 1,000, which he attained almost without effort.

The above account of his interest in learning figures on the calendar is also illustrative of the same feature: he chose himself the particular step in his study of arithmetic at the given time.

His interest in halves and quarters is another example: it also was spontaneous and all-absorbing.

The third point to note is, that he always uses most of his arithmetical knowledge in work and play, applying it as soon as he gets it. This perhaps is the explanation of the surprising fact, that he hardly ever forgets what he has learned in arithmetic. Thus, after the long intervals in Spring he always emerges with a firmer knowledge of numbers than ever. Yet, at the time, he seems to have forgotten very much, at least does not give satisfactory answers, if put to a test. But as soon as his interest revives,—if even for one hour,—all his previously acquired knowledge reappears unharmed and even fortified. This possibly may be also attributed to the excellence of his memory. I do not know whether his visual or his auditory memory is better, for he excels in both kinds.

II. The Growth of A.'s Conception of Time

At the age of eighteen months A. began to understand short narratives of a few simple sentences, which described little events of his own life within his memory. He was greatly interested in these "stories," but the time element had to be eliminated: the whole "story" had to be told in one tense—we used the past—in order that he should understand it. The first "story" ran something like this: "Oh, a dog was here; he jumped, jumped, and made: hah, hah, hah, and kissed baby. And baby made: nice, nice!"

Soon however both present and past tenses were used, as the stories grew longer, always truthfully reproducing his own experiences. But up to two years of age he did not understand the future. At two his conception of the past reached as far as three or four days, at least he remembered well events three or four days old. He certainly must have remembered older experiences, but only events three or four days old were vivid enough in his memory to be used with success in our "stories." Two months later stories of events several weeks old invariably obtained a quick and intelligent response.

The first conception of the future I noticed at two, when he began to understand the future tense. It was then that we began to tell him about anticipated events: a walk that was planned for the afternoon, a brook that we were going to see, a hill that we would climb, a goose that we would stop to look at, goats that we would feed, etc. He understood these "stories" very well and looked for the promised things.

At two years nine months he could use all tenses perfectly well himself, thus having mastered by that time the notions of the past, present, and future, the grammatical forms that express them, and the secret of applying these forms to the ideas he wanted to express.

At that age he remembered very well the relation between "yesterday," "to-day," and "to-morrow." Once he remarked: "funny: yesterday was 'to-day,' and now it is again 'to-day!'" This remark he repeated many times, at different intervals, sometimes modifying thus: "Is it again 'to-day?' how funny!" Later on, at three and a half, he began to wonder: "yesterday this, now, was to-morrow; now it is to-day! isn't it funny?" or—"where is yesterday—you know, that was 'to-day' before I went to sleep?"

This wonder at the fleeting time he expressed many, many times, until, at the age of four and a half, he asked: "When will the days stop coming? And where do they come from-Each day goes away—where does it go to? Another one comes—from where? How many days are there over there, where they come from?"

Was he personifying "the days" in any way then? Seemingly he was.

From babyhood A. loved to watch the sunrise and the sunset, and it became a habit with him. He began to associate night with darkness, morning with the sunrise, day with the high sun, and evening with sunset at the age of three, and had it all worked out in an harmonious system by the time he was three and a half years old. He then became very precise in using " morning," " noon," " afternoon," " evening," " night," associating them both with the meals and with the position of the sun. " Morning " and " afternoon " were divided by the " dinner " (our noon meal), while the division between " morning " and " night " was the sunrise. But, with the advance of Winter, we began to rise before dawn, and he would wonder: " I can't sleep any more. Is it morning? Where is the dawn? Why does not the sun rise?"

The trains were passing by several times a day in full view from our windows. It was his delight to watch them, and every time he would count the cars and make conclusions. He noticed the regularity of the trains and asked every time, " what time is it?" He thus learned, at three years eight months, that the passenger train, north-bound, passes by at " six thirty in the morning " and at " six thirty in the evening," and that other passenger trains, south bound, pass by " at ten in the morning." These hours of the day became therefore distinctly different from other hours and it was in relation to these hours that time was determined, when A. wanted precision. By the time he was four years old, he would say: " supper is late to-night; the 'six thirty' passed about an hour ago, I think." His appreciation of " an hour," was, of course, not in strict accordance with the real length of time; at first it was ridiculously different—either much too long or by far too short. But pretty soon he gave ample proof, that his notion of " an hour " was quite correct.

The regularity of school work helped A. to arrive at this perfection. When, in the Summer of 1918, he went to his little school, he would play on the campus an hour before his school began, and this, I think, contributed toward the precision of the " hour " idea.

At four years four months he was made happy by the gift of a broken alarm clock. The alarm bell could ring, though the clock mechanism did not work any more. He was greatly amused, when he found that he could make it ring, and would play at " waking people " at different hours. He thus learned to tell the hour, and soon learned also the quarter, half and three quarters. When four years ten months old, he told the hour of the day (by the clock) in the following manner:

" It is five minutes after a quarter after three " or " three minutes before half past five," or " one and a half minute after a quarter till seven "—and never made a mistake.

While in the process of learning to tell the time, at four years five months, he began to show interest in the conception of "a minute."

"How long is a minute?" he would ask. I would take down my clock and show him the minute divisions, then we would both watch the hand move. Sometimes we would try to see, how many minutes we were busy dressing, undressing, combing etc. He was then as intensely interested in his study of the minute, as he has been at three and a half in studying halves and, later, quarters.

He also asked several times—"How many minutes are there in an hour?"—"In a half hour?"—"In a quarter?"—but did not remember the answer.

At the age of four he knew the seasons well and learned the days of the week (with a tendency to omit Thursday, which mistake he makes sometimes even now, at the age of five years two months). At the age of four years seven months—at the period of his enthusiasm for the calendar—he began to learn the months of the year, and showed a clear conception of the seasons. At the age of five he was well acquainted with the twelve months, their chief characteristics, and with the principal holidays. Of course, this progress was helped along by talks, stories, verses, and pictures.

III. The Growth of A.'s Conception of Space

At two years ten months A. first showed an inclination to consciously measure space. He then became interested in the expressions "long" and "short." "Big" and "small" were already in his possession. He asked me then many times: "Is this a long pencil or a short pencil?" I showed him the relativity of sizes and introduced him to the comparative and superlatives. He liked that—liked to put two pencils alongside each other and to compare their lengths; to see which of two books is longer,—in a word, to measure. In this, as in everything else, he was surprisingly precise. Thus he would refuse to acknowledge two books as "just the same," if their length differed by a quarter of an inch.

Step by step, comparing first two similar objects, then different objects (a pencil and a book), he began to measure two objects with a third, used as a unit (a string, a stick, a ruler), trying to see, how many times he could put his unit in the length of the object measured. Measuring became his delight, and from the age of two years ten months to three and a half he was engrossed in this occupation several times a day, sometimes making it the basis of a game. Thus he would play "carpenter" and would measure parts of floors, window sills, garden seats, etc. Or he would make me "telephone " to his " store " and order oilcloth, and he would come and measure my tables to find out how much oilcloth I needed.

This measuring began spontaneously and seemingly without outside influence or example, except that my answers to his questions evidently led him on to the next step. But at three years two and a half months we moved into another house, and the activities incidental to arranging and improving a house gave him much material for imitation and expansion in his measuring activities, and also no doubt served as further stimuli for his interest in this direction. Sometimes he would be contented with superficial imitation—the characteristic " play like " of childhood. But more often he really measured and for the moment was genuinely interested in the results. Of course, I tried to direct his measuring to objects within his easy reach and not beyond his arithmetical knowledge at the given time.

Thus he learned to appreciate space and could tell at sight, at the age of three, which of two objects, differing a few inches, was longer. However, when asked to reproduce from memory the length of some familiar object, he would give ridiculously incongruous answers. Not until he was over four years of age was he able to reproduce sizes from memory by movements of his hands and arms with any degree of accuracy.

At the same time he did not use many adjectives of dimension, and the few in his vocabulary he used indiscriminately, " Big," " wide " and " long " were synonymous, all meaning " large."

At three and a half he used freely and correctly " high " and " low ;" while " wide " and " narrow " did not become specialized terms of a linear dimension until the age of four and a half. " Thin," " thick," " fat," " lean," " deep," " shallow " he learned to use correctly during his fifth year.

In spite of the paucity of his vocabulary in the expression of ideas connected with space, he was able to embrace mentally quite wide areas at the age of three. Indeed, his sense or orientation was very good even at the age of two, when he knew the way to his home from all four directions, two or three blocks away in each. At three and a half he knew not only the names of the three stations on the Interurban, but their relative positions with regard to his home town and to the city with which the interurban connected it.

He could tell his address at the age of three and knew the situation of several streets in his home town. At three years two months he would trace in his sandpile the streets adjacent to his own and three or four parallel to it.

At three years seven months he learned to know the names of several States of the Union, some cities in each, and had no trouble in understanding that a State is composed of cities and that many States form our country. At four years four months he gave the following definition: "It is like this: Norman, then the country, then another town, then the country, then again a town—and so on on all sides. This is a State."

At four years I told him the story of Columbus, and he understood perfectly well the spacial interrelation between Europe, the Atlantic Ocean, and America.

A. also showed interest in large spaces and understanding of "near" and "far." Thus, on his trip East, at the age of four years two months, he remarked, after a night's travel on a train: "We are far from Norman now, may be two miles." And some six hours later: "Now we are two and a half miles away from Norman—aren't we?" When we came to New York, he said: "Oh, how far we are from Norman,—may be seven miles!"

His appreciation of sizes of imposing magnitudes showed itself several times, as for instance, when our train stopped in Syracuse, N. Y., he said: "This is a large town, much larger than Norman." And when asked why he thought so, answered: "The buildings are much bigger than in Norman, and I see street-cars full of people, and there are large stores."

In connection with distances the following little dialogue is of some interest (at four years two months, after having been on the roof of a four-story apartment house):

A. The sky is higher here in New York than it is in Norman, isn't it?

His Aunt: Why do you think so?

A. Because there are such high houses here.

His Aunt: Then what of it?

A. Don't you see how high above the roofs the sky is?

His Aunt: Yes?

A. And in Norman the sky is just as far above the little houses as it is above the big houses here.

When he was four years four months old, there was considerable talk in his home about building, and plans of houses were studied. He naturally became interested in plans and began to study them himself and try to draw plans of his own. He learned to make plans very well. Thus, at the age of four years eight and a half months he gave the following proof of it.

I sent him on an errand to a house which he had never seen before, though he knew the people. I told him the name of the street (he knew by that time all the streets in our part of town) and gave him the house number on a slip of paper. When he came back, he told me that he had found the house by its number, but as nobody was at home, he left the thing I sent by him, in the front room, having slightly opened the door. I said: "Are you sure it was not the wrong house? Tell me how it looks." "All right," said he—" give me a piece of paper and a pencil, and I'll draw the plan for you." He drew such a correct plan of the walks to the house, the porch and the doors on it, that we had no doubts of his having found the house.

Maps have attracted him from the age of four years and four months. I suppose the coloring has much to do with it. The first maps which he examined were those of the U. S. He saw the first one accidentally, asked what it was, and when told, would study it. He easily understood the conventions of the map and the proportions; and had no trouble in appreciating the map of his own State. He likes to trace the rivers, to find cities and especially to study the railroad lines. At five he could easily handle a map, and only his illiteracy prevented him from finding on it anything he pleased. He never mixed up names, never looked for the Atlantic Ocean in Oklahoma, or for Europe in New York City.

Discussion

A.'s interest in time is two-fold: the arithmetical interest asserts itself in measuring time, the broader aspect, philosophical in its character, finds expression in his wonder at the passing away of day.

I have not noticed as strong a seasonal rise and fall in A.'s interest in time, as in his interest in numbers. The mental growth in the direction of appreciation of the time element has been almost evenly distributed throughout the year, and quite a few new steps have been taken in Summer, and even in early Spring. It was in Spring that he learned to distinguish some of the hours of the day by the movement of trains; in Summer he learned to understand the length of an hour; in Fall he began to learn to tell the time by the clock; in late Fall and Winter he was getting acquainted with the minute.

His interest in time, like his interest in number, is spontaneous and his knowledge was obtained by self-instruction.

A.'s interest in space also does not seem to depend upon the seasons.

Some of its phases were less spontaneous than his interest in time and in numbers—they were rather due to imitation. Thus, measuring at one time was decidedly influenced by the activities of carpenters and other workers in our house; his interest in plans was certainly due to our studying plans at that time, and has passed away since we no longer are busy with plans of houses. But the growth of his appreciation of space and of his sense of orientation is as natural as is the growth of his body; and his interest in maps seems to be wholly his own. Perhaps it grows partly out of his interest for tracing lines and designs. Since the age of four he has liked to follow simple patterns on fences or rugs, traces of wheels on the ground, rails on the railroad, etc., to make "train-tracks" himself, or to draw them with pencil or chalk. There is no doubt however, that since the symbolical meaning of the map was explained to him, it attracted him also as a symbol of the wide world; for he not only traces rivers, railroad lines and boundaries on the map, but also is very much absorbed in studying cities, and countries; and he loves to hear about them.

HOW COLLEGE STUDENTS PREPARE THEIR LESSONS

By Thomas Russell Garth, University of Texas

The purpose of this study is the experimental determination and evaluation of the methods of study of three groups of college students taken as representative of the great body of students in American colleges.

While we have treatments of How To Study and directing the study of students in which the authors (McMurray, Earhart and Swayne) have shown successfully that much of study is of a very inferior sort, the burden of these is to show how the process should proceed and how to direct it, as we have said, and only incidentally do these excellent writers undertake its quantitative determination. The intention here is to make an effort to compel the studying process to take an objective form so that it can be measured.

Method of Securing Data

The method of securing data used here has objectionable features; that is, students are often poor introspectionists and are more or less unsuccessful in putting their introspections into objective form. Other methods for securing data for this problem which we have undertaken to solve, in a measure, may at some time be devised, but for want of those better methods we have used this one with objectionable features.

College students were asked to write " confessions " of how they prepared their lessons and to leave these unsigned. Two hundred such statements were obtained from two colleges, one in the South and one in the West.

The Handling of the Data

In order to bring these " confessions " into such form that they could be evaluated, they were handled by the Order of Merit Method perfected by Cattell, Thorndike and others and especially after the manner used by Hillegas in his well-known work, "A Scale for the Measurement of Quality in English Composition by Young People."

The samples were first sorted out in five piles running from poorest to best by four judges including the writer. From these five piles five samples were selected from each pile making twenty-five samples. These twenty-five samples were then judged by one hundred competent judges from universities, colleges, and normal schools fairly well distributed over the United States. The judges were persons directly engaged in the study of educational process; some are people of note and many are persons who, while gifted with pedagogical discernment, are not very prominent excepting in their immediate neighborhoods.

The business of securing judgments was a matter of considerable time—four years, and the small number of judgments, one hundred, is in part due to the fact that many who were asked to participate were unable to find the time to arrange the samples. Some were sceptical about the advisability of treating the data in this fashion. The cooperation of those who did participate is deserving of much commendation for it was no small thing, either in respect to time or energy, to arrange the samples (these were at first mimeographed and later printed on tag-board cards) in order of merit, placing the poorest method at the bottom and the rest above it, according to the judge's best judgment, until the best method would be found to be on top. Records were made of these orders, and a tabulation of these was obtained so as to bring all the judgments into relation.

By following closely the method used by Hillegas in deriving his scale, a scale for methods of study was derived from these data. The scale values and the samples are found in Table I. It will be seen on examination of this that only nine of the twenty-five samples are used in the scale. Because of the fact that the others were either equal or very nearly equal to some one of these nine, they were discarded as having little value for the purposes in hand.

TABLE I

Sample	Difference From Preceding	Difference From Sample 225
225		00
370	7	7
230	19	26
277	130	156
272	86	242
279	78	320
316	78	398
310	86	484
375	41	525

After the scale had been derived, new "confessions" were added to the one hundred and seventy-five original samples which had not been judged by the hundred judges, and these were rated according to the scale. These results will be given below.

THE SCALE FOR MEASUREMENT OF METHODS OF STUDY OF COLLEGE STUDENTS

The samples selected for the scale and their values are given herewith. No effort was made to obtain experimentally a zero point in method of study. Sample No. 225 is decidedly the lowest one in the scale according to the opinion of the judges. It cannot truly be called a zero value, but we have arbitrarily taken it as a zero value "over and above what any common sense person might do in the way of study."[1]

Value 0—Sample 225

"I read the lesson over carefully from about 3 o'clock to 4:40."

Value 7—Sample 370

French II. "I first seek to get everything prepared for studying, such as poking the fire, putting cushions in my chair, and resting my feet on the table. After I have made due preparations for such a heart-rending task, I open my books and find that I don't know where the lesson starts, so as I wish to see if I received any mail, I go over to the post-office and stand around talking awhile. Finally I sum up courage enough to approach some member of French II class and ask him where the lesson starts. As I notice a blank look coming over his face, I become aware of the fact that I must seek another man, so approaching the star member of the class, I ask him for the information. He tells me without even consulting his note book. Then I wend my way homeward for the purpose of studying.

I give the fire one more vicious poking and then seat myself and get in good position to start looking up words and reading French. Those words which are important I generally have to look up twice before I am able to remember them. I try to bear in mind the general run or rather plot of the story and this aids me in remembering words, but before I look up any word in the vocabulary, I give a guess at the meaning and then look it up to find out whether my guess has been correct. After working at this until my fingers become sore from turning back to the vocabulary and my mind becomes sluggish and lazy, I carefully, though thankfully, lay my book on the table and try my luck on a new study, with the resolute decision of finishing my French II early in the morning while every one is asleep. Next morning I wake just in time to jerk on my clothes and walk very hastily to breakfast."

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[1] The writer is under obligation to Professor E. L. Thorndike for this suggestion.

Value 26—Sample 230

"I study my lesson in advance and then take notes in class. Sometimes I will not open a book for a week. Two of my classes are purely lecture work so I just take notes."

Value 156—Sample 277

"I do my studying in the afternoon or evening. The manner in which I do my work is according to the subject. If many points are mentioned, I take notes, but if not I take no notes and then when I go to class I make notes of principal points."

Value 242—Sample 272

"In lessons such as Math. and Chem. I work all the problems until they are as nearly correct as I can make them, and I learn every important point in the lesson, but in Psychology and History, etc., I generally merely read the lesson although sometimes I make an outline of the main points."

Value 320—Sample 279

"In studies that are reading material such as History and Psychology I read over and underline important parts, then review underlined passages. In Math., which I am making my chief study, I try to solve the problems; then if I do not succeed I then try to read the instructions. Very seldom study after dark, because I think many students ruin their eyes by studying by electric light."

Value 398—Sample 316

"I always study first those subjects which I dislike most. In Math. always study the principles first and then apply them to my problems. In other subjects I use an underlining method, by which I underline all principal ideas and facts. This is a great aid when it comes to reviewing, especially at examination time. Comfort has a great deal to do with my studying. I have to have a light a certain way, my chair, etc., all suitably arranged. The time of day is also of importance. Such a time as hour from 5 to 6 is utterly lost."

Value 484—Sample 310

"Reading subjects as History, Psychology, etc. (1) Thorough reading, (2) Brief notes on important points, (3) Notes allowed to cool, (4) Notes looked over, and contents called up.

Written subjects: as English work, etc. (1) Rough draft drawn up, (2) Final copy written, with corrections and alterations.

Scientific subjects: such as Chemistry, Physics, etc. (1) Read carefully, (2) Thorough notes taken; (3) Notes allowed to cool; (4) After which only notes studied, very handy for examinations.

Mathematics: I try to work the assignment.

In all my studying, whenever interest is lost, before the assignment is completed, I set aside that work, taking it up at a future time, and try to study some widely different subject."

Value 525—Sample 375

"Before entering into an analytical discussion of this topic, I might preface the fact that I cannot study anything that requires concentration while any kind of noise is going on, unless perhaps one to which I have become acquainted, and accordingly I endeavor to study in quietness.

On considering the subject from a more specific standpoint, I find that in general my natural tendency is to crystallize, materialize, or cast into a more tangible form, whatever I am studying, if it be not already in that form. This manifests itself in probably four different phases or methods: First, when the subject-matter is largely memory work, as in certain of the sciences (e.g. biology) grammar and syntax, unclassified theory, etc., I generally fix it in my mind by writing notes and synopses and so reducing it to a more concrete form: Second, whenever possible as in the sciences, I find the drawing of diagram of great value: Third, the application of rules and theories as in Math., to practical problems, engages my attention even before the rules and theories themselves are understood: Fourth, in languages such as French and German, the giving of concrete examples appeals to me much more than the formal statement of the rules and laws, which I not infrequently neglect in favor of the former. In general I may say that on such subjects as English which are more or less exegetical and philosophical by nature, my tendency is (I believe) to generalize, view the subject telescopically so to speak, and make considerable use of the principle of Association. On such subjects as Mathematics and Sciences on the other hand, where for the most part reasoning is close, concise, and exact, I follow what might be called the intensive method, i.e., concentration entirely on that portion of the subjects under discussion without thought or reference to what has gone before. In every kind of study, however, I find that the principle of association comes into operation to a greater or less extent, as my mind is constantly connecting various other facts and ideas as I come across them in preparing a lesson with other facts and ideas that I have learned or even only met with in previous reading and studying.

Another general assertion I might make from another point of view is that my first reading over of the lesson affords me a more general insight into the subject as well as the acquisition of the more important and outstanding features, while the second perusal familiarizes me to a greater degree with the details."

Variability Among the Judgments

While it is not intended to undermine the integrity of the experiment by criticising the reports of the judges, it would be interesting to ascertain to what extent there was agreement between the several persons who judged the material. This is no criticism of the judges. On the other hand, the scale is the result of the pooling of their judgments. For that matter the scale must not be regarded as a "criterion" for all study.

Hillegas penalized his judges for the purpose of showing the reliability of the judgments. We penalize them here to show what a vast difference of opinion is to be found among competent educators on the score of proper method of study.

Table II is a tabulation showing what penalties were given for placing a sample below where it belongs on the scale as derived. Table III gives the distribution of penalties assigned to the several judges. Among the four whose penalty is 0, i.e., whose arrangement of the sample methods of study was practically identical to that of the arrangement of the scale, is a supervisor in one of the southern Normal Schools, one is an instructor in a northern Normal School, one is a graduate student in one of our foremost Teachers Colleges, and another is a university professor very prominent in educational research.

An examination of Table III shows that some of the judges had opinions very divergent from the common opinion represented by the scale. One judge, the author of a series of elementary textbooks, placed the samples in almost reverse order from that of the scale. In fact the Median of the penalties is far up the scale and the range runs from 0 to 269. The measures of variability are high. These facts would justify the conclusion that while there is sufficient unanimity among the judges to derive a scale more or less satisfactory, many of the judges do not agree altogether with the results.

TABLE II[2]

Penalties for Placing a Sample of Less Value Above one of Greater Value.—(When 375 is placed below 310 the penalty is 2; below 316, it is 4; below 279, it is 6; etc.)

S	S	P		P		P		P		P		P		P		P
375	310	2	316	4	279	6	272	6	277	8	230	10	370	5	225	12
310	316	4	279	8	272	10	277	12	230	12	370	12	225	14		
316	279	4	272	7	277	9	230	10	370	10	225	14				
279	272	4	277	7	230	10	370	9	225	12						
272	277	4	230	9	370	7	225	14								
277	230	6	370	4	225	6										
230	370	1	225	3												
370	225	0														
225																

How College Students Prepare Their Lessons

After having derived a scale for determining quantitatively how college students study, samples were taken and rated by the scale. The material thus measured was the remaining one hundred and seventy-five samples left after the twenty-five which were judged by the hundred competent judges had been taken out. We shall call this Group A. It is composed really of two groups, as the students who wrote them are from the two colleges, in the South and West. Group B is composed of fifty-seven normal college students. The writer rated these specimens, being the only judge employed here. The samples of Group A were rated by him three times, of Group B twice, and these ratings were averaged. The results were distributed as below:

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[2] The above table is gotten by ascertaining the differences (M.D.) between each sample and any other sample which does not rightly belong above it and a more or less arbitrary value is given that difference. For instance the difference between 375 and 310 is 34 and the penalty for placing 310 above 375 is 2; the difference between 375 and 316 is 74 and the penalty is 4.

See Hillegas, "A Scale for the Measurement of Quality in English Composition by Young People," pp. 58-60.

Scale Value	GROUP A Frequency	GROUP B Frequency	TOTAL Frequency
0– 99	18	6	24
100–199	15	3	18
200–299	64	18	82
300–399	49	14	63
400–499	10	9	19
500–599	2	7	9
	158	57	215
Ave.	264.2	315.6	287.7
A.D.	83.1	115.8	84.6
P.E.	70.2	97.9	71.5

Table III.—Distribution of Penalties given to judges for wrong order.

Penalty	Frequency	Penalty	Frequency	Penalty	Frequency
00	4	38	2	76	
1	0	39	0	77	
2	1	40	1	78	
3	1	41	0	79	
4	9	42	1	80	
5	4	43	3	81	1
6	3	44	0	82	1
7	2	45	2	83	
8	3	46	0	84	
9	1	47	0	85	
10	0	48	0	86	
11	4	49	1	87	
12	3	50	1		
13	3	51	0		
14	4	52	0		
15	3	53	1		
16	2	54	1	99	1
17	1	55	1	100	1
18	1	56		223	1
19	3	57		236	1
20	4	58		269	1
21	1	59			
22	0	60		Total	100
23	1	61	2		
24	1	62	0	Median	19.5
25	1	63		P. E.	13.5
26	4	64		Q.	15.8
27	0	65		A. D.	23.69
28	0	66			
29	1	67	1		
30	0	68			
31	0	69			
32	2	70			
33	2	71	2		
34	2	72	1		
35	1	73			
36	0	74			
37	1	75			

(In Group A there were 17 statements giving no method and as these were thrown out, only 158 were left to be measured.)

The average rating for Group B is slightly better than that of Group A though it is, according to the judges, just a little better than mediocre study or something better than half-way up the scale. The average for the Group A approximates a point half-way between 0 value and 525, the value of the best sample. The two groups, as indicated by the average of the two taken as one, are slightly better than this half-way point. By referring to the scale one can see that this half-way point lies between Samples 272 and 279 whose values are respectively 242 and 320, but more nearly to the former than the latter. Here the student claims that he learns every important point in the lesson in some subjects, but merely reads some lessons in other subjects, sometimes making an outline of the main points. Of the total group of 215 only 9 receive a rating of the highest point on the scale, i.e., 525 and 24 lie between the arbitrary zero and 99.

If to study in the true sense of the word is to think, and the present writer might be allowed to suggest where purposive thinking undoubtedly occurs on the scale, it would appear that of these 215 students only nine of them really study according to their confessions. That is 4% of them are pursuing their studies in true problematic fashion. If this be true, what can be said of the remaining 96%? It would appear that they are engaged in some form of memoriter work.

AUTOMATISMS IN STUDY

By E. Leigh Mudge, Washburn College

An absolutely quiet school room is the ideal of an unscientific pedagogy. Even adults make many more bodily movements during an hour of study than they realize. A very little observation or a very simple experiment will demonstrate this. Few of us realize how much activity there is, for example, in our toes. An attempt to sit for five minutes without a movement of a toe will illustrate how active these usually unobserved members tend to be. In deep study most, perhaps all, of us engage in certain apparently irrelevant movements, such as tapping the floor with the foot, tensing various muscles, frowning, pursing the lips, etc. Professor Lindley has found as many as 136 distinct automatisms which are involved in close attention and study. And let anyone observe the movements of a classroom of studying children, free from the usual inhibitions of adult life, and it will be evident that there is reason for some of the sounds and movements of the desired-to-be quiet school.

A class of seventeen young women in college recently listed the automatisms which they recalled having frequently used, together with the physical conditions of successful hard studying. Of these, fifteen mentioned some sort of manipulation of the hair, running their fingers through it, twisting a lock, fastening it more tightly with a comb, putting in hairpins and taking them out, or pushing the hair back from about the ears and neck. Thirteen spoke of various other movements of the hands about the face and head: rubbing the temples or forehead, supporting the forehead or the chin upon the hand, rubbing the ear with the hand, etc. One spoke of the tendency, when a statement is difficult to grasp, to tap the forehead and repeat the sentence rythmically. Fourteen mention the positions or movements of the feet. Of these, five must have the feet off the floor in order to study well, three must sit on one foot, and others mention crossing the feet, tapping the floor, sitting with the tips of the toes resting on the floor, and wiggling the toes. Eight students mention a tenseness of muscles, frowning, and the strain of which one is not aware until at the end of the period of intense study when there is a sigh and a relieved stretching of muscles. Eleven persons mention the use of a pen or pencil, aside from actual writing involved in the work, in tapping on the table, tapping upon the teeth or else being firmly held between the teeth, making letters or figures of various kinds, or tracing a line upon paper until the paper is worn through. One runs the pencil through the hair, and one recalls the childhood habit of "writing with the tongue." Other automatisms mentioned are: rocking back and forth, walking, frequently shifting position, talking aloud, and humming a tune. Several mentioned the need of a not too comfortable chair and of loose, comfortable clothing. One student, "when ready to make interpretation or association necessary to fix the point," lets her eyes wander, perhaps looking out of the window at some tree or other object.

At first thought, all these movements seem irrelevant to the work of the student. The universality of some such automatisms, however, seems to indicate that they have some practical value. Certain muscle strains appear to be characteristically involved in a state of attention. We can best attend when there is a degree of muscle-strain. And the function of the often slight auxiliary movements is probably in their drawing off of certain surplus values of nervous energy so as to prevent their discharge in irrelevant and diverting thoughts or actions which would disturb the central thought process. Professor Karl R. Stolz, in a study of "Auto-Suggestion in Private Prayer," has shown that the use of the rosary by Roman Catholics, Buddhists, and others, involves this principle. The slight movements in manipulating the beads and the habitual repetition of monotonous phrases provide "an outlet for distracting impressions." If this is true, and if the various bodily movements of one who is in serious study actually contribute to the success of his work, it is clear that a certain degree of freedom of movement is absolutely essential to the mental as well as the physical welfare of school children.

BOOK NOTES

The Historical Child. By OSCAR CHRISMAN. Bost., Richard G. Badger, 1920. 471 p.

Dr. Chrisman is one of the pioneers in the study of children in this country, and we owe to him the term "paidology" to designate this field. He has in this book brought together very interesting and new material, which only Ploss had ever attempted to compile in any other language. The chapters are devoted to the child in different countries, e.g., Mexico, Peru, Egypt, India, China, Japan, Persia, Judea, Greece, Rome, in medieval Europe, and finally in the United States. This book certainly fills a long-felt need among English students of the subject, and everyone interested in children should be acquainted with it.

Education During Adolescence. By RANSOM A. MACKIE. N. Y., E. P. Dutton and Co., 1920. 222 p.

This book, the author says, is based partly on G. Stanley Hall's "Psychology of Adolescence." After a general chapter on education during adolescence, he divides his material into successive chapters as follows: Six-Year High School Curricula; Principle of Election in Education; Changes Proposed in Secondary Education; Required Subjects: The Social Studies, English, and History. The author has put into this work studies of many years, and he has brought together in a more systematic way the various articles he has printed elsewhere. At the end there is an excellent bibliography of over two hundred titles.

Modern Elementary School Practice. By GEORGE E. FREELAND. N. Y., The MacMillan Co., 1919. 408 p.

The author has here brought together the results of many practical and theoretical studies in an interesting way and with a somewhat novel purpose. The scope of the book can best be indicated by its table of contents, which is as follows: The Application of Educational Theory, The Problem Method, The Project, Motives, The Doctrine of Interest in Practice, A School Subject Taught Through Interests, Utilizing a Common Interest, The Development of a Natural Interest, The Selection and Emphasis of Subject Matter, Selection and Evaluation in English, Selection in Arithmetic, Spelling, and Writing; Methods Which Foster Health, Less Sedentary Practices and Methods, The Individual-Social Balance, Methods of Adjusting School Work to Individual Needs, The Socialization of Instruction.

Human Psychology. By HOWARD C. WARREN. Bost., Houghton-Mifflin Co., 1919 460 p.

The author has for many years been one of our leading teachers of psychology and here brings together the results of his experience. While his own psychological proclivities are evident, he is not blind to other aspects of psychology and has given us here a comprehensive study which is admirably adapted as an introduction to the topic. The chapter headings are as follows: The Science of Psychology, The Organism, The Neuro-Terminal Mechanism, Physiology of the Neuron, Stimulation, Adjustment, and Response, Behavior, Conscious Experience, The Senses, The Components of Mental States, Primary Mental States, Secondary Mental States, Succession of Mental States, Attitudes, Character and Personality, Organized Mental Life, with an Appendix containing chapters on The Mind-Body Relation, Mechanism and Purpose, Neural Activity, and The Visual Process.

Man and the New Democracy. By WILLIAM A. MCKEEVER. N. Y., Doran, 1919. 250 p.

In view of the greatest tragedy in history—"Ten million slain; one hundred million homeless; countless millions sad"—the author proposes a radically new interpretation of the world war and a plan for the reconstruction of civilization which will practically reverse the old order of things. The momentous heap of wreckage is symbolic of the contempt of the Almighty for the so-called achievements of modern civilization. It is a little difficult to state briefly or even find out precisely the author's revolutionary principle, but it is apparently to go back not merely to human nature but to child nature and to build up better generations—"A little child shall lead them." A new system of education could make democracy creative, teach it that work is a means of salvation, give a new interpretation to motherhood, adolescence, religion, health, loyalty and altruism. The problem is whether we are ready for democracy, which means reorganization from within, making life more worth while, increasing the spirit of sacrifice, teaching optimism, realizing the dangers of obsession, and thus warring on white slavery. The fact is psychology is the basis of human betterment, and the next generation must improve on the past and the present. Thus new demands are made upon psychology.

An Ethical System Based on the Laws of Nature. By M. DESHUMBERT. (Tr. from the French by L. GILES). Lond., The Open Court Publ. Co., 1917. 231 p.

This work, we are told, has already appeared in seven languages. In a Preface by Dr. C. W. Saleeby it is said that it "is a real contribution to the didactic literature as yet so scanty and inchoate, of the Religion of Life." Ethics, in a sense, long anticipated evolution, and just now we are making history so fast that we are in danger of forgetting the past. But Spencer, Darwin, Bergson and Ellen Key have made contributions to the practice of the Religion of Life founded on evolution which can never die.

The author undoubtedly has been influenced by Confucius and perhaps by the doctrine of return to Nature, and his chief interest is to know what the real aim and tendency of Nature as manifested in her works is. He has set forth his general theory in a very comprehensive and somewhat philosophical way and in Part II he contributes a complement to the theory in the form of answers to objections, while Part III is devoted to duties and precepts, and the final chapters are on Death.

My Country. By GRACE A. TURKINGTON. Boston, Ginn and Co., 1918. 394 p.

This is a textbook in civics and patriotism for young Americans. It is written to meet present needs and not those of five years ago. America and her people, her relations to liberty, the making of Americans, the children's age, why we have schools, how things come about, representative government, paying the people's bills, an enemy of the United States, efficiency, war, the army and navy, our flag, etc., are the most salient of its twenty-three chapters. The work is illustrated by many cuts.

Applied Arithmetic. By N. J. Lennes and Frances Jenkins. Phil., J. B. Lippincott Co., 1919. 283 p.

This is the first of a three-book series, and is intended to end with the fourth grade. Special attention is paid to the selection and organization of subject matter, derivation and application, and motivation. There are many cuts calculated to make the problems objective and concrete.

General Methods of Teaching in Elementary Schools. By Samuel Chester Parker. Boston, Ginn and Co., 1919. 332 p.

This work is intended for normal and training schools and for teachers' reading circles, and is the outcome of fifteen years' experience. It covers the kindergarten and first six grades. Part I is devoted to Fundamental Points of View, with five chapters; and Part II to Learning Processes: General Aspects.

The Gary Public Schools: Measurement of Classroom Products. By Stuart A. Courtis. N. Y., General Education Board, 1919. 532 p.

Here we have an attempt at a survey of the Gary public schools tested by classroom products. After a general statement of the tests given and the conditions, there are separate reports on handwriting, spelling, arithmetic, composition, reading, with subsequent chapters on factors affecting performance and finally general conclusions.

Americanization. By Eli Mayer (with an introduction by Dr. John H. Finley). Publ. by The Sophereem Co., Albany, 1920.

Educational Sociology. By W. E. Chancellor. N. Y., The Century Co., 1919. 422 p.

The purpose of this book is to serve as a general introduction to sociology with especial reference to education, which fits for society. It is divided into three parts: I, Social Movements, with seventeen chapters including The Nature of Human Society, Public Opinion; II, Social Institutions such as The State, Property, The Family, The Church, School, Art, Science, Business, War; III, which is perhaps the most interesting, is entitled Social Measurement, with chapters on The Social Survey of the Community, Institutional Workers, and The Socialized Mind.

Scientific Handwriting. By Charles T. Luthy. Peoria, 1918 (Publ. by the author). 233 p.

This is an interesting and comprehensive work divided into two parts, the first on Execution with sub-heads on many topics, such as The Desk, Paper, Pen, the Fingers and their movements, size and form of characters, the arm, finger, and wrist action, and the method to be followed in school, which the author says must be logically correct. Part II is entitled The Basic Parts of the Letters, and this deals with loops, ovals, etc. The work is very copiously illustrated.

Armenia and the Armenians. By Kevork Aslan. (Tr. from the French by Pierre Crabitès). N. Y., The MacMillan Co., 1920. 138 p.

This is, to a great extent, an epitome of the author's larger volume published in 1908 entitled *Etudes Historiques sur le Peuple Arménien.* His former work extended only through the eleventh century, but a later edition brought the history of Armenia up to date. In the successive chapters the author treats of the geographical configuration of Armenia and the origin of the people, the formation of their royalty and its various dynasties, the conversion of the country to Christianity, Armenia under the domination of the Byzantine Empire, the Seljuk invasion, and finally the Armenians during the nineteenth and early twentieth century.

Manual for Conservation of Vision Classes. By WINIFRED HATHAWAY. Publ. by Nat. Com. for Prevention of Blindness (N. Y.), 1919. 108 p.

The author treats of the history of sight-saving classes in America, gives us reasons for establishing classes for the conservation of vision, takes up the subject of equipment (many illustrations), medical school inspection, systems under which conservation of vision works, discusses Cincinnati's cooperative plan and cooperation generally between the grade and the special teacher, vocational guidance, criticizes existing conditions, and outlines future possibilities.

An Introduction to School Music Teaching. By K. W. GEHRKENS. Boston, C. C. Birchard and Co., 1919. 132 p.

This book seeks only to give general information concerning matters pertaining to music teaching in public schools from the point of view of the supervisor and the school superintendent. Accordingly the author treats such topics as the modern educational trend, the value of music as a school subject, appreciation as an end in music, the work in music of the first three grades, of the intermediate and upper grades, the importance of ear-training, instrumental music in the grades, high-school music, the chorus, theory class, and finally he describes the work of the supervisor and grade teacher, with an appendix on the former's library.

The Project Method in Education. By MENDEL E. BRANOM. Bost., Richard G. Badger, 1919. 282 p.

Modern education attempts to direct the child's development so that he will be a worthy participant of the institutional life of society, and also to develop the particular abilities of each for the sake of individual initiative. Rapid evolutionary changes in society have emphasized the need of reëvaluating and of reorganizing subject matter, the author tells us in his Preface. Accordingly he here gives us fourteen chapters devoted to such subjects as the evolution of the project as an educational concept, its relation to instincts, teaching and learning by projects, the project-question, -exercise, and -problem, manual or physical projects, the method in History, Geography, with final chapters on the reorganization of the course of study and the preparation of the teacher.

War Addresses of Woodrow Wilson. Ed. by A. R. LEONARD. Boston, Ginn, 1918. 143 p.

There are three reasons, we are told, why the study of President Wilson's war addresses may wisely be included in the course of study in every secondary school. The first is their intrinsic literary merit; the second, their timeliness; and the third, the connections with the war. We are also told that the President authorized the printing of these addresses in the present form, of which there are fifteen in all. The value of such a publication is obvious.

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A PARENT'S STUDY OF CHILDREN'S LIES

By EUGENIE ANDRUSS LEONARD

I. THE PROBLEM

No problem of parenthood is more insidious or persistent than that of children's lies. Evidence of childish deceit is known to precede speech and in spite of the most arduous endeavor, to remain long after a wholesome moral tone has been established in other phases of social living. It is one of the child's first conflicts with our standards of conduct and the last to be satisfactorily settled. In fact, of some fifty authors who have written on the subject only three maintain that no lie, however heroic, is justifiable, indicating that even in late adult life the moral issue is not without numerous conflicts and compromises. For parents the problem of dealing constructively with children's lies is many sided, subtle and fraught with deep moral significance. It underlies the other childhood sins and is often used as a shield by the child to protect his other vagaries from parental knowledge and supervision.

As soon as the child realizes that others were not present when he did something or that they may not know what is in his mind, he is able consciously to deceive and invariably does so. The first little deceptions are almost too common place to the observing parent to need elaboration. The child takes up a forbidden object and, on being observed, hides or discards it and assumes a delightfully innocent expression. If he is given the option he will unhesitatingly protect himself from punishment by any form of deception that occurs to him. In the exciting experience of living all means are fair that contribute to his happiness. Deception and lying at this early stage are merely means of gratification without any moral value whatsoever to the child. It is only when the child matures enough to feel the sting of broken confidence between himself and his parent that secrecy of wrong acts takes on a moral significance for him.

A four year old nibbles at the cake on the table but when questioned by her mother quickly denies having touched it. The mother smiles and says she smells cake. The child accepts the information with glee—no secrets here. She can be her happy self. She admits taking several nibbles without reserve or regrets and declares she will never do it again "because we need it for the company and it doesn't look nice all nibbled that way." When asked why she at first denied having nibbled at the cake she replied carelessly, "Oh, I was just joking." In other words, "It didn't amount to anything—I was just trying out a deception on you and it didn't work. It evidently isn't worth much. I feel fine this way."

In all probability if the deception had "worked" she would have felt just as "fine" until sometime when that means led to a break in the common consciousness of the parent and child and then would come the difficult struggle in which even we adults are involved,—shall I deceive or shall I face facts? In any event, whether at four or six years each child meets the issue and it is for us as parents to make those deceits destructive to wholesome living, appear unsatisfactory from the outset.

In order to realize the breadth of the problem it will perhaps be well to summarize the various definitions and synonyms commonly used to express the type of conduct being considered. To lie is to state falsely, or to act for purposes of deception. To deceive is intentionally to mislead. A falsehood is "an intentional statement of untruth designed to mislead another," and "implies strong moral censure and a charge of intention to affect wrongfully the acts, opinions or affections of another." Thus we do not include "conjuring" but rather the meaning of such words as, untruth, equivocate, quibble, dodge, prevaricate, evade, shuffle, mendacity, counterfeit, dissimulate, simulate, feign, fraudulent, hypocrisy, dissemble, romance, fib and fabricate.

All of the above synonyms involve the idea of deceit in varying shades of intensity and therefore do not indicate either the genesis of our problem or the complexity of the moral situation. Back of all intent to deceive lies the abilities of the child in accurate perception, memories, judgment of corresponding values and native suggestibility. This phase of the problem is the genetic or background tissue out of which the moral values grow. Until a child has developed some judgment of the relative value of the means he is using he will not be greatly impressed by their destructive qualities. Until he perceives the difference between imaginary and real objects he is unable to give a truthful account of any event, and until he can recall that difference, his imperfect memory, and not deceit, is responsible for his incorrect recollection of anything. When five year old Jane tells her cousin she saw a mountain trout six feet long we know that the story involves imperfect judgment of the relative size of a twelve inch mountain trout and a six foot rule, a desire to give effect to her story by imaginative exaggeration which is not clearly differentiated from real facts, and an imperfect ability to recall anything accurately. A careful study of children's lying should include consideration of these abilities and their development in order that the parent may have an intelligent basis for judgment of inaccuracy.

Further the synonyms given all carry with them more or less " strong moral censure " which implies a degree of uniformity of adult opinion and action in regard to deceptive lying which is far from true. No two adults regard any act of deception with the same emotional intensity and hence do not judge it the same. Almost invariably in the instances of lying collected, the writer felt the lie to be grossly wrong when it was likely to affect him adversely but rarely when the blame fell on another. To our Puritan forebears a healthy flight of childish imagination was evidence of blasphemy; to us it is the natural expression of a normal instinct. One mother fearing that her child would develop untruthfulness punished rigorously every expression of inaccuracy. By the time the child was twelve she was found to be hopelessly backward in English composition and devoid of any power for original thought. Several conferences between the mother and the child's teacher finally resulted in a new plan of action. The mother is now doing all she can to repair the damage done by her inflexible rule. Unfortunately even her rigor did not save the child from lying when the intensity of childish fear occasioned a real temptation but rather encouraged it in certain habitual reactions. After considering several such cases one hesitates to agree with the author who holds that a lie never did mankind any good either in past or in future ages. At one stage in man's development we know that perpetuation of the race and even personal existence depended largely upon deceit. The other day a baby boy playing near the table discovered a prune which had fallen to the floor. He grabbed it, rushed from the room, closing the door and hiding behind it. Safe at last from interruption he devoured seed and all. Upon being followed and questioned regarding the seed, he assumed an expression of blank innocence and spread out his hands to show he did not have it. Upon further questioning he pretended to hunt for the prune. The incident recalled similar ones from Bleek's "Bushman Folk Lore" where the maintenance of individual and group life depended so frequently upon the ingenuity with which the Bushmen deceived the wild animals among whose haunts they lived. Prof. St. John has made a study of "The Genetics of Veracity" in which he indicates the necessity of protective deceptions in animal life, particularly in the less advanced stages where both strength and mental qualities are lower than in those among whom they live. The folk lore of nearly every race bears out the testimony that existence has been aided either, unconsciously, as in lower animal life by protective deceptions, or consciously by the ingenuity of the animal or primitive tribe. Whether we have arrived at the golden age of truth telling is a much mooted question even among the elect. Such studies, however, do indicate that the problem is shot through with complexities of moral value to all parents.

II. Source Material

The two sources of material which seemed worth while for the study were, a collection of instances of children's lies from adults and children and the literature bearing on the subject which is available in the University Library. The latter offered very little except as it suggested the popular viewpoint of the problem. Of some forty-three available discussions of the subject many were superficial dealing humorously or facetiously with the problem. Such titles as, "The Perfect Liar," "The Pleasure of Deception," "The Unlovely Virtue of Truth Telling," "The Tedium of Truth" indicate the attitudes of the authors. Several more serious discussions such as G. S. Hall's "Children's Lies," St. John's, "The Genetics of Veracity," Clayton Hamilton's, "On Telling the Truth," Miss Latham's, "Study of Falsehood" and others offered considerable suggestive material but none of them covered the subject thoroughly nor offered much that would be of practical value to parents. Taken as a whole the discussions supplied the setting of current opinion on the problem and indicated the complexity of moral standards involved.

The collection of instances of lying was acquired from two sources; namely reminiscences offered by college students and friends numbering 294 and instances offered by the boys and girls of a Junior High School numbering 379. The total number of instances studied was 673.

All of the contributors were told, when requested to relate an instance of lying, that a serious study was being made of the problem and that no names or signatures were desired. Safe from any possibility of discovery they responded, with but few exceptions, without apparent restraint. Of the adults five wrote that they could not recall an instance of lying, but 187 or 64% wrote personal accounts. Of the children fifteen girls and one boy wrote that they could recall no instance of lying, but sixty girls or 36% and 66 boys or 30% gave personal accounts. Thirteen boys misunderstanding the instructions wrote fanciful tales resembling "Arabian Nights" with evident delight. The actual lies range from trivial social excuses to intense moral struggles and even pathological cases. The children's attitude toward the lie related was not directly asked for but was freely given in over half the stories.

The study of instances of lying has been made with two main purposes in mind; first, to determine what emotions, situations and impulsions make children lie and their attitude toward the lie, and second, to determine with some definiteness a standard of morals in regard to lying which may be of value to the average parent facing the difficult problem in the work-a-day world. The number of instances is thought to be large enough to cover the main causes of lying and the children's attitude toward lying. To determine a fairly definite standard of morals in regard to lying out of the confusion of ideals presented in the discussions of the problem we have added a study of the accepted standards of vocational morals, social ethics, religious quibblings, poetic license and the standards of conduct embodied in the world's classic and modern literature.

It is evident that from such limited data and study, no hard and fast rules of conduct could be deduced but rather, general conclusions and helpful suggestions for meeting problems of parenthood.

III. UNIVERSALITY

At first reading the data as a whole impress one with the *Universality* of the experience. The instances range from three years to mature parenthood, appear equally early in either sex and are present in the earliest and latest literature. One might hastily conclude, the liar ye have always with you. The quest of Diogenes is forever hopeless; if it were not for the balance of morals which point forward toward an ideal of sincerity which is more to be desired than literal truth. G. S. Hall concludes in his study that lying is in all of us and Kirkpatrick in his " Individual in the Making " says that as soon as a child discovers that others do not know what he has thought or done, he is almost sure to try to deceive them when pain or loss of a desired thing may result from truth telling. Six children and one college student related the story of the child who maintained that he or she had never lied, inferring plainly in each instance that such a statement was the " biggest lie of all." Lie all children do, and perhaps must, even the most conscientious. It is for us as parents to admit the fact in regard to our own treasured darlings and meet the problem intelligently lest our children repeat the experience of one college student who wrote that she could recall no instance of lying in childhood, as her parents had been very rigorous regarding literal truth, but that she lied frequently and deliberately now that she was not subject to their constant interfering supervision. It is probable that her parents had made the mistake of quibbling over literal truth and ignored the greater and more lasting virtues of sincerity, sense of fair dealing and consideration for the rights and feelings of others. Another mature student stated that she had yet to meet the person, who upon intimate acquaintance, was not found to lie regarding at least some one phase of living. For instance, one honest soul was scrupulous about the truth except as regard to her health and another as regards to certain family affairs. One would hesitate to call a kindly soul a liar merely because he did not tell a long story regarding his aches and pains or another because she did not prattle her personal affairs when by mere chance your question required these or an evasion of the truth. It is doubtful if one becomes a " Liar " by an occasional lie, or a child by even fairly habitual lying.

All literature is replete with instances of lying. The Bible contains numerous instances. Folk lore from Norseman to Bushman teems with tales of connivings and deceptions. The so-called classics contain no less number and modern fiction is a network of quibblings and deceptions. So thoroughly ingrained in our thinking is the experience that we scarcely stop to think of it unless the facts are pointed out. How often does one hear the expression " No one is perfect " and surely it is doubly true as regards to truth.

IV. Causative Factors

We have grouped the instances of lying under the three main activities of the mind, namely: (1) intellectual deflections from the truth, (2) emotional impulsions to deceive, and (3) wilful inventions intended to deceive the hearer. There is necessarily considerable over-lapping of the factors involved, so that the grouping has been made by the dominant factor. For instance, Sam told his mother he had been at a friend's house playing when he had really been to the park riding a burro. He was very sore as a result of the ride and so told her he had a stomach ache. In relating it Sam admits he was afraid that he would be punished for running away and he felt that he needed sympathy and care instead of punishment just then. He loved his mother more dearly than ever in his suffering and to chill her warm sympathy with the truth would have been most distressing to him. Besides, to tell mother the truth would involve "tattling" on his sworn friend and would eliminate the possibility for them both of ever being able to go again. So he stuck to his story but each lie necessitated another. It is evident Sam lied first to avoid punishment, then to get sympathy and care and later to sustain his story. In this case to avoid confusion, the instance has been listed under fear of punishment since the later lies rested on the first misrepresentation. The subdivisions under each main head grew out of the study of the instances and were added gradually as new situations suggested them. Space permits of the inclusion of only a few of the instances collected.

1. *Intellectual Deflections.* Under intellectual deflections from the truth have been grouped the childish imagings and exaggerations. There were seventy four instances in this group, or twelve per cent of the total number. With the exception of seven adult exaggerations all the instances occurred before the thirteenth year. They included simple childish romancings or imaginative tales and exaggerations to create a sensation or attract the attention of the hearer. The stories seemed to offer no personal advantage except as they made the teller the center of interest for the moment. One delightful child relates, "I remember that when I was a child I would relate to my parents and friends wonderful and strange things which I said I had seen or had dreamed of. They did not believe, of course, that I had seen these things but thought that my memory painted them so vividly that I thought I had, while on the contrary I did nothing of the kind. I was aware the whole time that I had never dreamed these strange things nor even seen them. I knew perfectly well that I was merely imagining them but for some unaccountable reason I told of the imaginings as if they had been actual happenings or dreams."

Another boy in the Junior High School offers an instance of imaginative exaggeration that is humorous. "Once when eight years of age and when visiting my grandfather in a small town in central Michigan, I dug a rather large hole in the ground. A few nights later a severe thunderstorm occurred. The following morning when talking about the storm to a boy of my own age who knew nothing of the hole, I casually told him that the lightning had struck close behind my grandfather's house and made a big hole in the ground. (I had in mind the hole of my own digging.) Having lied so far my imagination helped to elaborate and I went on to describe how the potatoes were scattered, and other details which I don't remember now. When he showed a strong inclination to investigate I went on further to tell how I had 'squared up the hole' and cleared away the potatoes, making it look 'as if I had dug it myself.' At the time I felt no pangs of conscience, later I did."

Professor Kirkpatrick says, "It is as important for a child's intellectual development that he shall learn to distinguish clearly between real experience with persons and things and those that he images, as it is for his moral development that he should act and speak in accordance with what he knows to be real." The child gains such ability by playing that things are other than what he knows them to be, thus bringing his imaginings and knowledge of real things into sharp contrast. Hence imaginary companions are valuable to him in contrasting the difference between real people who do not act at his willing and imaginary ones who do act at his bidding. The constant testing out of his powers first on the one and then on the other, further helps him to accurate perceptions of the qualities each possess. The child who eats grass while he is playing he is a horse appreciates the attributes of a horse much more keenly because he has sensed the difference between their food and his. He gets a more accurate picture and so is more capable of knowing the truth regarding horses. He comes to less readily believe a thing merely because he would like to have it so, for he has tried that out and found it disappointing. He comes to rest more upon his own actual perceptions rather than his imaginings or the statements of others. So long as he acts out his imaginings he is gaining a constantly clearer mental picture of what is true and objectively real. He comes to recognize the imaginary element in figures of speech and catch the moral of fairy tales. In short he becomes an astute discerner of truth.

H. Addington Bruce in a recent article stated that he considered lying in children chiefly due to an hysterical expression of suppressed imaginings and two instances that we have studied have shown marked signs of hysteria. One college student wrote quite frankly of her experience. "The year I was eighteen, and in my last year at high school a notable event took place. Wallace Reid, the famous 'movie star' came in person to San Francisco. He was to appear at a certain theatre only once, and unfortunately this appearance was to take place in the afternoon during school hours. Being young and foolish, I felt that my presence at this one and only appearance was a matter of life and death, but it was a difficult matter to arrange, because extreme illness was the only excuse upon which I would be permitted to leave school. Accordingly I set my emotions and imaginations to work, and after a very short period of concentration, actually grew alarmed at my imagined symptoms of illness. Being a species of 'pathological Liar,' I actually for the time believed that I had every reason for woe, and even managed to summon tears as evidence that I was quite incapacitated to continue the afternoon's work. The teacher, on observing my wan looks, grew very sympathetic and took me to the Principal, who was also solicitous and prescribed a period of rest at home. The difficulty was that I had lied so convincingly that it was only by feigning a speedy recovery that I was permitted to depart without an escort to see me safely home. This lie stands out in my mind more prominently than others because I was for the time being, so occupied with working up the necessary artistic effect that I completely lost sight of the ultimate object until I was safely out of sight of the school."

Nathan Oppenheim, taking the physician's viewpoint concluded that most children's lies are due to bodily disturbances which distort their perceptions or morals and interfere with the transmission of conceptions and perceptions from the internal to the external processes of expression. There is undoubtedly a lowering of the mental abilities as well as moral fibre in cases of vitiated strength or pain, but we have been able to find no studies on the subject with which to sustain the viewpoint. Professor Demoor suggests that lying is a physical disability and should be treated as such by segregating the children in special classes. Certain types of highly imaginative children would be greatly aided by special sympathetic instruction in clear perception, apperception and memory, and similarly unimaginative children would be benefited by special help in developing the imaging qualities they lack. Also, special care in nerve control in cases of hysteria and clearer moral ideals in cases of lowered moral tone due to environment, or companions, would be helpful to a young deceiver, but the problem is universal and hence would not permit of treatment by segregation.

Most of the lies falling in this group are merely the expression of immaturity. Such tests as Binet proposed for testing children's accuracy in perception and memory indicate this clearly. Following his suggestion William Stern with others has developed what is known as the "Aussage tests." The experiments were made by showing a group of children a picture of a living room in a peasant's home and then requesting them to write in narrative form what they saw and later to answer questions regarding the picture. The results were five to ten per cent errors in the narrations and twenty-five to thirty per cent errors in answer to the questions, showing a high degree of suggestibility. The children of seven years returned fifty per cent of errors while the children of eighteen years returned only twenty per cent of errors. Prof. Stern concluded that the errors were due to what the children thought they ought to see in such a picture, what they really forgot, what they unintentionally added to give picturesqueness and a lack of self criticism in checking up these errors with what they really saw. R. Oppenheim showed thirty girls from ten to twelve years a well known colored print and asked fifty questions regarding it. Of the returns forty-nine out of ninety answers were correct. Repetition showed a great improvement in fidelity of perception and memory.

The experiments of Miss Borst and Prof. Wreschner also indicated that the capacity to see and report correctly may be readily educated in children. All the children's reports showed a greater percentage of inaccuracy than those of adults. Prof. Stern reported the correct statements as doubled at thirteen years and trebled at eighteen years.

William Healy in dealing with delinquent children gives a simple test by showing a picture of the interior of a butcher shop. He finds that his returns give him a fairly accurate estimate of the abilities of the child in correct perceptions, apperceptions, memory and suggestibility. It is interesting to note that he finds the delinquent child who is a liar by necessity passing such tests only a little below the average child indicating that even where intense fear constantly provokes the child to defensive lying it does not seriously affect his mental abilities at least during childhood.

Such studies offer us three hopeful conclusions. First, that the imaginative tales of our children are but the healthy expression of immaturity; second, that experience with real things tends constantly to correct and clarify the uncertainties that exist in their minds, and third, that even unusually imaginative or unimaginative children can be trained or educated to a normal standard by careful help in forming accurate perceptions and memories.

2. *Emotional Impulsions.* Under emotional impulsions we have grouped fear of physical punishment, of disapproval, of ridicule, of being deprived of some desired thing, desire for praise or sympathy, to protect another or personal and secret affairs and to insure another from anger or jealousy. Of the four hundred and thirty-nine instances in this group one hundred and ninety-four instances or forty-four per cent were due to fear of punishment, eighty-seven instances or nineteen per cent were due to fear of disapproval and thirty instances or seven per cent were due to fear of ridicule, making a total due to fear of social or physical discomfort of three hundred and eleven instances or seventy per cent of the group and forty-eight per cent of all the instances collected.

G. S. Hall, William Stern and several others who have studied the problem seriously have found the same majority of lies due to fear. As Kirkpatrick says, " deception is the principal means of defense of weak creatures whether human or animal when exposed to danger from the strong." There is little doubt but that children are often " Weak creatures—exposed to danger from the strong," as the following instances of each type of fear indicate. Fear of punishment is illustrated by the child that " had been told not to go into the house of the little girl she was playing with, and to come home sharply at five o'clock. The child disobeyed in both particulars—not intentionally but more through carelessness—when she got home about six o'clock her mother was very angry and asked her sharply why she did not come home on time and if she had been in the house of her little girl friend. The child saw a severe spanking in store for her; therefore, said she had not been in the house, and made up some fictitious excuse about her late arrival home."

. The fear of ridicule is not less important as one girl's story shows. " When I was about ten years old I innocently wrote my name with my finger tip in the dust on the back of a friend's carriage that had just come from the paint shop. Several days later the friend was at the house again and asked me if I had done it. I was very much surprised to see that my name was scratched on the buggy. Unconsciously and unknowingly my nail must have scratched it. Frightened I denied having written it. The woman asked my sisters, who said it was my writing, but still afraid I kept on denying it.

Only my mother took my part and said she knew I would not have lied had I done it. Then I could not tell. Every night I would spend a couple of hours of misery before I could go to sleep. One day my father saw the buggy and naturally recognized my writing. He came home and asked me why I had done it. Again my mother was going to interpose, but it was too much, I told the truth then and slept better that night than I had for a month."

To the child, approbation, praise, and unbroken social relations with those about him are as essential to healthy growth as fresh air and sunshine. To assimilate his food and get the proper exercise he must feel constantly that all is well between him and those about him. A chill atmosphere of indifference or disapproval produces a depression of all his faculties both physical and mental. The most scientifically fed orphan in an asylum is found to be from two to three years retarded both in physical and mental growth beside the child reared carefully in a happy home. Fear of Mother's or Father's frown or repulsion is almost as acute as fear of physical pain. Hence the frequent lies even when no punishment is expected. As one child put it, "To my parents I am about the most perfect child that ever was born. Not that they would object if anyone criticised me but they feel that I shine out above all criticism." When she was repeatedly naughty and her teacher sent home a note she says, "But I just couldn't get myself to present these notes to my doting parents. I was too proud to have my Mother look at me and say, 'I always thought you were a little lady.'" She saved her pride by lying, a perfectly rational means of self defense from her standpoint, until one day it failed.

To avoid rupture and punishment children quite mercilessly shift the blame of their acts upon another child and seldom seem to regret it. One boy states, "When I was a little boy I broke a window with my football. I ran to father saying 'Look, brother broke the window.' My brother accordingly was punished."

Of the other emotional impulsions the desire for sympathy, understanding and a goodly portion of approbation came first in number of instances. It included fifty-six instances or fourteen per cent of the group. They illustrate how far we as parents fall short of answering this innate need of our little ones. Too many times in the rush of "Twentieth Century" living we forget to hold sacred the brief moments of intimate companionship with our children which are the main spring of their self respect and later strength of character. To know some one is backing them unreservedly in all they do helps in untold moments of temptation. A boy of thirteen years writes, " When I was about seven years old I told a friend of mine that my sister and I were twins. She was the same height as I was, but was a year younger than I, and in a lower grade at school. It all went well until my birthday came. He gave my sister and me both a present. I don't remember telling a lie ever since. I told the lie to show him that I was smarter than my sister, because I was in higher grade."

Of the selfish lies there were thirty-three or seven per cent of the number in the group. They were chiefly told in hope of preventing the loss of some desired toy. An odd ball or top, or marble, having attracted their attention, was taken and later the act denied. Most of these were told between children and generally by the person from whom the toy was taken. Under such circumstances the lie was generally denounced, as in the following instance, but not so when the lie was told by the relater. " One day when I was playing marbles with a boy, I lost one of my marbles. I was looking for it for about a half an hour. A little while later I saw the boy I was playing marbles with pull it out of his pocket. The next day I asked him if he found it and he said he didn't. (Boy twelve years.)"

There were only twenty-one heroic lies in the group and eleven others which had an element of unselfishness in them, making up but seven per cent of the group. Of the twenty-one heroic lies, all were told to protect the life or happiness of another. Several were adult equivocations which had evidently been told to the children with some pride in the unselfishness of the act. The eleven instances told to protect a secret or personal affair were less unselfish but still held enough of the Don Quixote spirit to seem justifiable in the sight of the teller. One little girl of thirteen years had been given a gold banded fountain pen for Christmas. While taking charge of a second grade class during the teacher's absence for the morning, one of the pupils became headstrong and took the pen away from the girl—and threw it on the floor, breaking the pen. A few weeks later the girl's mother asked to borrow the pen. She immediately answered that it had been stolen but on being questioned closely she said that she had broken it. Her reason for the lie was that she was afraid that the child who had broken the pen would have to pay for it. Another girl of sixteen " when asked her grade in a certain class said she had received one hundred when in fact she received only seventy. She of course knew she was telling a lie but she felt that it was no one's business what her marks were, therefore felt she was not doing wrong."

Seven children related really malicious lies which were told in the heat of anger or jealousy and intended to injure another person. They remind one of the stories that circle about during political campaigns except that they were not premeditated and were generally regretted soon after they were told. One girl confesses, "When seven years of age I had a ring of which I was very proud. I played with a certain little girl constantly. One day she was playing with my ring and in some way lost it. This child was known to be rather untruthful. As a result the story which I in my wrath concocted of her having intentionally thrown my ring in the gutter, was believed. To this day I have a feeling of guilt when I meet her."

Our study of this group of instances made clear several points: first; that children's deceptions are chiefly a handy means of avoiding undesirable consequences, second; that the great majority are impelled by fear, third; that the child is extremely sensitive to smiles and frowns and conducts his truth telling and lying very much by them, fourth; that children are essentially egotistical and will lie readily to gain a desired object or vent their anger, and fifth; that children do recognize the problem involved in truth telling and do rise to the understanding and telling of heroic lies to save the life or happiness of another.

3. *Willful Inventions.* Under willful inventions have been grouped those lies which lacked emotional intensity and which were more or less premeditated. One hundred and thirty-three instances, or twenty per cent of the total number of instances, came under this grouping. The chief causes were a desire on the part of the child to gain his own way, to be relieved of some work or tedium, to avoid paying for something or, with adults, to obtain professional ends. There were ninety instances or sixty-eight per cent of the group which fell under the willful desire on the part of the child to have his own way. Most of these were entirely selfish and did not differ greatly from those told to avoid work or tedium. There were thirty-nine instances of the latter which were generally casual reactions to unpleasant demands. One delightful child "with other children in the neighborhood, was accustomed to ask the man in the corner grocery store for candy. They would always say their mothers sent them and that the article should be charged. Finally a bill came to this child's mother and she told the grocer not to give any more sweets to the child unless she sent a note. One day little (4 year old) Mary

came with a piece of paper and handed it to the grocer. He opened it and saw nothing but scribbling which Mary meant to be writing. He asked what it was for and she said, 'Can't you read that it says that you should please give Mary some candy.' Of course she got the candy in spite of the lie." Another less clever girl writes, "I had to take a music lesson every morning from eight to eight-thirty. One morning I wanted to go to school early to play but mother insisted on my taking my music lesson. I started out for my lesson but walked straight past the house and went to school. When I came home mother asked me why I didn't go to my lesson. I insisted that I went, but Miss G. was not home. She didn't answer the door. I kept up the lie for two or three days. (Girl 8 years old.)"

Such lies are dangerous chiefly because, although the discrimination and memory remains clear a power to dissimulate is acquired in order to accomplish the ends desired and the more often it is indulged in the more dangerous it becomes. Because they do not involve deep emotions, such lies are rarely regretted or brought to the focus of the child's attention. They remain a casual means of getting one's own way. Two of the Junior High School girls apparently justified such lies by so wording their statement of untruth as to dodge the actual truth and yet give a literal truth. They headed their accounts with "True Lies" and seemed to feel rather proud of their ability to both tell a truth and obtain their own way by dodging the real truth. Such an attitude is particularly dangerous because the ideal of truth telling becomes clouded and involved and the child's conscience suffers from the loss of frankness in dealing with the lie. He justifies his evil intent in the literal truth which taken in its right sense would not be a truth at all since it conveys the meaning of an untruth. If the child is to be taught the difference between truth and falsehood he must be made to see and recognize a truth as the essence of the meaning he conveys by his statement not the literal interpretation of his words.

4. *Other Causative Factors.* From so small a collection of instances of lying gathered indiscriminately from college and Junior High School students there can be no conclusions regarding sex differences. In Prof. Stern's experiments women returned fuller accounts in the "assuage tests" and more errors, the men's accounts being more conservative and more accurate. Miss Borst and Prof. Wreschner found that women returned more detailed accounts with a higher percentage of accuracy than men. But such studies are inadequate as yet and only indicate the possibilities of the field. In the present

study the slight predominance of instances told by women is due to the fact that in the college classes where the requests for instances were made there were more women enrolled. The significant facts for our study are, that both boys and girls pass through the period of intellectual immaturity and hence frequently digress from the truth, that both are impelled to lie from the same emotional impulsions, and that both consciously invent fabrications to obtain desired ends.

Whoever has seen Houdini or one of his followers cannot but be struck by the imperfections of even adult ability to perceive accurately. Although the audience is conscious that Houdini is going to deceive them and may have determined not to be deceived, nevertheless Houdini apparently waves his hand and becomes instantly invisible before their eyes, or becomes suspended in mid-air without visible support. The same adult imperfection of perception is brought out in every court trial where several persons testify to the events of a certain occasion. No two people testify with the same degree of accuracy nor can anyone of them testify with absolute accuracy. This being true it is quite apparent that immature children cannot be expected to adhere closely even to adult's knowledge of truth. Further, children lack judgment as to how to relate what they have perceived. In a series of events they may suppress just that detail which adults in their experienced judgment recognize as important and decorate, or enlarge upon that detail which a mature mind would discard as unessential. This is often done unconsciously as the expression of immaturity, and should be recognized and dealt with as such by the parent.

"There are more lives spoiled by undue harshness than by undue gentleness," says Hugh Black in his book on "Friendship." "More good work is lost from want of appreciation than from too much of it." This is particularly true of children. So often the way a question is asked provokes the untrue answer. Parents forget the natural timidity of children. They forget that children in a sense are recapitulating the race; are passing through the struggles of all mankind from necessary animal deceptions through primitive man's connivings against wild beasts far stronger than himself to the clearer moral atmosphere of confidence. If the parent's attitude is belligerent or even uncertainly cold the child follows the cue and drops from frank confidence to the level the parent has established by his or her manner. No one can honestly blame a child for dodging his responsibility when so accosted. In fact his misdemeanor becomes only an incident to cover up. The avoiding of physical or social pain

DIVISION OF ATTITUDES REGARDING LYING BY CAUSES

Attitudes	Imagination	Fear	Disapproval	Tedium	Invention	Deprivation	Approval	Heroic	Ridicule	Secret	Sensation	Professional	Avoid Paying	To Injure	Total	Total
Felt lie was painful memory..................	1 ..	34 29	11 ..	4 5	7 4	8 1	8 5	2 ..	2 ..	1 ..	4 2	1 ..	.. ..	2 2	84 48	132
Felt lie was expedient to end in view...........	.. ..	22 14	16 8	4 4	22 5	4 4	6 2	6 2	3 8	.. ..	1 ..	1 ..	.. ..	.. ..	85 43	128
Felt lie was harmless.....	10 6	1 ..	.. 1	1 ..	.. 1	.. 1	1 1	1 ..	.. 1	1 1	6 13	.. ..	.. ..	.. ..	21 25	46
Felt lie was justifiable, resented punishment...	.. 1	6 2	4 ..	3 4	8 ..	.. 1	2 ..	3 3	1 ..	.. 4	1 1	.. 2	.. ..	.. ..	28 18	46
Felt lie was useless......	.. ..	12 8	4 1	1 3	1 ..	2 2	1 1	.. ..	1 ..	1 ..	.. ..	.. ..	.. ..	1 ..	24 15	39
Felt doubtful of lie......	3 1	4 4	2 ..	3 ..	2 ..	1 1	1 ..	.. ..	.. 1	.. ..	1 ..	.. ..	.. ..	.. ..	17 7	24
Totals................	22	130	47	32	50	25	28	17	17	8	29	4	..	5	415	415

becomes his first consideration and the parent's attitude generally determines the means to be used. One might go so far as to say that the parent's or questioner's attitude determined all lies told from emotional compulsion and many willful inventions. If whole-hearted confidence exists between the questioner and the one questioned it is doubtful if any child would often feel the need of lying from fear or desire of any kind.

It is only as Prof. Melinand points out when the child discovers that in social living he may not be absolutely sincere; that he must not tell all that he knows; that he cannot be his natural self but must conform to certain standards of politeness which forbid wholehearted activity, that he becomes habitually dissimulative. He discovers that others about him lie, even that acme of perfection, his father or mother. Then, being frequently the center of attention he cultivates his audience and is stimulated to exaggerate or invent to keep their attentions or obtain his own way. A well known public speaker fearing the potency of this stimulation discontinued his public addresses. How much more dangerous must it be for a child who lacks both clear discrimination and moral judgment. The child soon learns by experience that lies may be " an abomination unto the Lord " but they are " an ever present help in time of trouble." One girl of thirteen years writes, " Sometimes I cannot help telling lies." Another seems to think it " natural for all small children to tell their lies or fibs in order to make their stories more probable. It is much the same as a game and almost as much fun as fulfilling the lie. Grown persons should not count much on children's lies or they would be misjudging them by ordinary child pranks which are soon outgrown. Falsehood in children is a game that children outgrow under the correct supervision of their parents and teachers! "

Truth, because it is learned chiefly at the parents' or teacher's knee is not very different from loyalty. To love and be loyal to one's parents is translated in the child's mind into acts which will meet with their approval, hence truth telling becomes one of the attributes of love and loyalty to the child. To be honest to Mother is to love her, but also to have an enemy is to owe him no such obligation. Children often feel no hesitancy about lying to a teacher they dislike because, " She didn't deserve to know the truth."

In the present study four hundred and fifteen or about sixty-four per cent of the total expressed their attitude toward the instance they related. Of these one hundred and thirty-two or thirty-one per cent thought that the lie was wrong.

One hundred and twenty-eight or thirty per cent thought the lie was expedient. Forty-six or twelve per cent thought the lie was harmless and an equal number thought the lie was justifiable. Thirty-nine or nine per cent thought the lie useless and twenty-four or six per cent were doubtful. The data is too limited to more than indicate that there is as great a diversity of opinion among children as among adults. The fact that less than a third thought lying wrong is, perhaps significant though not conclusive. (See accompanying table.)

V. Habits in Lying

Many things contribute to make a child a habitual liar but Prof. Kirkpatrick thinks that fear is the chief cause for " without it most children would find truth-telling more serviceable and satisfactory. In reasonably favorable surroundings the child who tries lying finds that though it sometimes works well, or for a time, yet unpleasant results come either in the form of punishment, ridicule or disturbance of social relations with others. So that he gives it up except under unusual stress of fear or desire. Under conditions of antagonism to others and of greater or less success in deceit, he becomes a habitual liar in spite of occasional punishment."

The habitual liar may be a child who has not learned to distinguish clearly between memory and imagination, or he may recognize the difference but substitute the one for the other to obtain his own ends until they have become so confused that he can no longer distinguish clearly between what is true and false. The continuance of any cause such as indistinct memory, fear of punishment, lack of appreciation or too great restraint in play will eventuate in habitual lying. It could scarcely be otherwise. Each success in lying makes the next easier, the skill greater and the temptation keener; and although most children do in a measure outgrow the habit, the frequency with which we find lying among adults indicates that the habit once established is difficult to overcome. One college student wrote that while she had outgrown the tendency to fabricate imaginary tales the tendency still remained to exaggerate to creat a sensation and lie cleverly from fear of social discomfiture.

Occasionally the habit develops a pathological case. It would not be of interest here to go into any lengthy discussion of pathological lying yet a brief statement of what is known of exaggerated lying maybe of profit if only because in such abnormalities we find the normal " writ large." William Healy has defined pathological lying as " falsification entirely disproportionate to any discernible end in view engaged in by a person, who at the time of observation, cannot definitely be declared insane, feeble-minded or epileptic." He found it to be a trait rather than an episode in the life of the child and shown throughout life. It is, however, never the sole misconduct but always follows other delinquencies. The mental processes are similar to that of author's only the pathological liar wants to both create his story and act the leading rôle. He confuses real life with his story and becomes so fascinated in the delightful pastime of living the assumed rôle that he ceases to pay the proper attention to other details of living. His moral judgment becomes vague and indecisive. He grows poetic and drifts about in free imaginative play. He resents being disturbed by real facts or jostled by real experience. In the "assuage tests" he uniformly invents additional objects and accepts many of the suggestions offered by the questions, indication how vague the distinction in his mind is between real and imagined objects. All but two of Judge Healy's printed cases had inherited an unstable moral make-up and several had had mental conflicts due to unfortunate early sex knowledge and experience which had given rise to the habit. He found that any period of mental or physical stress and especially adolescence tends to unbalance the mental abilities and befog the power of clear judgment. All of his cases developed during pubescence or adolescence and it is chiefly for this reason he feels that most such cases can be cured by sympathetic and intelligent care. When the period of physical and mental stress is over the child if carefully guided through the storm may recover poise and complete mental balance. The cure lies in following such simple rules as checking up at once, each lie, taking care in developing accuracy of memory and, where there is special ability in constructive imagination, an opportunity to use that ability in some literary pursuit. Such advice is sound for all parents and needs only to be emphasized where habitual lying has been allowed to develop.

VI. Contagion in Lying and its Relation to Other Delinquencies

Parental love has little lasting value if it is not an inspiring force to upright generous deeds. It is not such a force in the child's life unless it makes him feel that there is some one who thinks of him steadfastly and would gladly help him, not punish him, at each crisis. In much of his conduct when the parent is not present there is the thought of how the parent would view the act and "according as the child thinks the conduct would be approved or disapproved does he have an impulse to reveal or conceal it. His feeling of the approval or disapproval of others becomes his conscience. This conscience becomes stronger and enlightened in proportion as sympathetic relations are maintained and free communication kept up between parent and child. It becomes weak and perverted in proportion as sympathy is destroyed and the ideas and feelings of each toward the other are misunderstood or misrepresented."

All lying presupposes an estrangement between the parent and child and it is in such strained relations that suggestions of lying from another child take root. One little girl having been caught in a misdemeanor at school made a special trip to her friend's house to talk over the "fib" she had told their teacher that their stories might hang together. Several groups of children wanting to escape some work connived together to accomplish the deception. The instances are replete with such statements showing how potent is the influence of one child's suggestion upon another. Then, the fact that two or more are going to tell the same story lends an unwarranted feeling of strength and justification to a lie. It binds the children together in a secret which is destructive both to their moral life and their relations to their parents. One habitual liar in a group of play fellows may demoralize the whole group for, first of all the lie affords protection and the need of protection has always been the great force in banding men together. The "tattle tale," that traitor of childhood is held in the utmost contempt. Often he is ostracised from all play activity lest he be initiated into some secret and "spoil it all." There is much of the heroic in the lies to protect a gang secret but there is also a heroism in honest "tattling" provided it is not born of low aims. Even heroic lies are not necessary when Mother's gentle comprehension suffuses the child's thoughts of her. And such confidence is a mighty protection against temptation of all kinds for a lie strengthens every evil estranging influence. The protection it affords may be handy but it is perilous and the sooner the child is made to see its dangers the more hopeful becomes his outlook.

VII. Standards of Adult Conduct in Lying

1. *Social.* Since children's morals are determined so largely by those of their parents, a study of any phase of their moral problems would be incomplete if it did not include at least the larger aspects of adult's morals in regard to lying. Our conventional social life offers a striking paradox of standards. A lie implies "strong moral censure" yet our conventionalities

make their use a law like unto the "Medes and Persians." We are insulted at the barest suspicion of an accusation of untruth yet we are aware that we all constantly conform to "correct" standards and use "white lies" whenever necessary. A child soon learns how "incorrect" it is to contradict even that which he knows to be untrue. Certain truths must go unspoken: certain untruths must stand uncorrected. At first glance such a confusion of ideals seems absurd but our social life is not based upon superficialities. Our standards of social conduct are not a hit and miss jungle of unrelated rules of conduct. They are rather the expression of definite human needs brought into being by group life.

Five more reflective authors neither justified nor condemned lying but rather pointed out the difficulties involved in truth-telling. Miss Latham in her study of falsehood proves conclusively by an analysis of many vocabularies that all life and language are permeated with falsehoods and another writer seconds her conclusions by attempting to show that as an ideal truth-telling is helpful but in the present age an absolutely truthful person would be a moral monstrosity because our moral sense is still imperfect. We cannot do more than live up to the morals of the age in which we live. It is idle dreaming to expect perfection now. Clayton Hamilton points out that to tell the truth involves perfect perception, the selection of significant facts, the recognition of the truth of these, a knowledge of the principles induced, the ability to reduce the principles involved from abstract laws to concrete rules of conduct and the ability to express the result so the hearer will understand correctly. Even honest-minded people accomplish this only one time in a thousand for our perceptions are inaccurate, our judgment poor, we induce unconsciously what is untrue, evaluate the facts incorrectly and express even that which we believe to be true very crudely. Further, we assume that our hearer has passed through the same experience and will understand our expression of a truth as we do. This of course is untrue for no two people have had the same experience, so cannot have the same apperceptive basis for understanding. To the American mother the "beautiful German home life" is a debauchery of theatres and beer drinking. To Keats, "beautiful" and "good" were synonyms but to Cromwell or to Savonarola they were antithetical.

2. *Vocational.* In the vocational world the same confusion exists. Few medical men or nurses for instance, agree with Dr. Richard Cabot that no patient was ever injured by the exact truth regarding his physical condition. Most doctors

realizing their limitations modify this statement in view of what may develop to-morrow and their own inability to know "the exact truth," especially when they have a nervous or delirious patient to deal with. Mark Twain, feeling the force of this wrote a short story entitled "Heaven or Hell" in which he depicted two Puritan old maids who inadvertently caused the death of their beloved niece as a result of their extreme idea of truth telling. With hearts breaking over the burden of their sorrow they preserved the Mother's last hours in peace by lying hourly regarding her departed daughter.

In spite of the fact that a physician's success with any patient must rest on the patient's confidence in what he says, yet it is expected that the physician will not only diagnose the case correctly but will judge shrewdly what details to tell the patient and what to suppress or evade. It is entirely beside the point to say as Dr. Cabot does that the Devil is the father of lies and we admit needing his help when we speak falsely. The keen intellect of the specialist bending all his powers to solve a problem of malassimulation or high blood pressure is scarcely seeking help from the devil when he evades telling a crushing truth in the hope that it may prove to-morrow only an anxiety of his own imperfect knowledge.

The following quotation is taken from a recent issue of the "School and Society" showing the attitude of the press regarding the problem.

"Throughout last summer there was a good logical, if bad moral, reason why the American press should have given acres and acres of white paper to the misrepresentation of Russian conditions. We were about to intervene, or were actually intervening, and nobody could say how far intervention might go. In obedience to the principle, My Country, right or wrong; and if she is wrong, let not us her sons acknowledge it, a great many Americans, not in any way connected with the paid interventionist propaganda, made a duty out of blackening Russia, etc."

Whatever is to be said regarding such a national policy at a time of world crisis—it is well to recall that not all press deceptions are done for as worthy ends. During political campaigns the newspapers have undoubtedly fostered lying and misrepresented much regarding the character and abilities of opponents. Nor are the politicians morally above the newspapers which boost or defame them for they too are involved in the same adjustment of ideals and ambitions. The following advertisement recently used in a campaign illustrates the point. The gist of the placards advertising Mr. Brown for Superior Judge were

"Elect J. J. Brown Superior Judge.
(keep him on the bench.)"

Presumably J. Brown is to be re-elected to the superior judgeship but on the contrary he is to be elected there for the first time. Heretofore he has been a police judge.

The lawyer who hesitates to defend a client whom he believes is guilty, the commercial salesman who suppresses the bad qualities and enlarges on the good qualities of that which he is trying to sell whether it be real estate or coffee or stocks and bonds is passing through the same moral struggle. The pure food laws have helped the producer of food-stuffs by gradually taking the place of his backbone and judgment and standardizing truthful production and advertising. In all occupational fields this is coming to be true. The defamers of Theodore Roosevelt paid dearly for their political trick. The boosters of watered stock must answer for it in court. The producer of food-stuffs who claims ingredients which do not exist in his product stands in danger of heavy court fines. Each step in such standardization of truth in the commercial world helps in doing away with the temptation and dangers of misrepresentation. It is unfortunate that much lying may still be done within the law.

The field of vocational ethics in regard to lying is of interest in the present study for two reasons, first it forms a vital part of the child's environment and second the great majority of children soon enter one or other of the vocations and help solve its ideals. Hence it is worth while for parents to study the everchanging ideals of the modern business world and arrive at a fairly definite idea of the highest ideals in each field. It is of value that each parent subscribe his or her influence to the legislation which tends to standardize our ideas of truth in the business world, and it is equally worth while that we review our own conduct and ideals to be sure that they are in accord with those ideals which we wish to inculcate in the minds and hearts of our children. Nor should this apply only to the technical business world. Housewifery and motherhood are as truly vocations as salesmanship or civil engineering. They are as fraught with problems in truth-telling as the most complex professional vocations. Nor is fatherhood rightly eliminated from the field of vocations though for Americans it is seldom so dignified.

3. *Lies we Tell Children.* Only recently have parents considered seriously the vocation in which they are engaged in rearing their children. Previously children were allowed to grow to partial maturity before any concerted effort was made to fit them for life. At pubescence society suddenly took over

the matter of training for adult life. In primitive tribes it consisted of the rites of soldiery and marriage: in more civilized states it included apprenticeship in some vocation and entrance into the religious ceremonies. But to-day we start at the beginning. We know that the future statesman is determined by our vocational ideals as parents from the date of his birth. Hence it is of the utmost importance that parents review their ideals and conduct in regard to lying. If we tell our children that the moon is made of green cheese, that rabbits produce easter eggs and Santa Claus brings them their gifts at Christmas, how can we expect the child not to do likewise? We can tell the child the tale of moon made of green cheese making him realize the fanciful in it, or the story of St. Nicholas's life and how his spirit has come down to us without marring the exquisite qualities of either.

One boy in the Junior High School offered the following instance from his experience.

" While very small I was led to believe that if I told a lie a black spot would appear on my tongue. I firmly believed this and when I would do something I thought no one would believe me about I would stick my tongue out for them to look at. One day . . . I was afraid to tell her mother I had, so I said, ' No.' She asked to see my tongue. I was afraid to let her see it but I did. Strange to say she didn't see a black spot. I was surprised at first but I began to suspect that a black spot wouldn't appear."

There are probably no lies of parenthood more universal or harmful than those dealing with sex knowledge. Social customs have tended to debar all honest discussion of sex from any except professional circles. Fathers and mothers alike have shrunk from any discussion of the actual facts and as a result numerous lies have grown up. The stork, an angel, the doctor and even God have been accused of bringing the new baby into the home. Such lies are always pernicious for several reasons. First, they are untrue, second, every child must one day learn that they are lies, third, they deal with the most significant fact in human life, fourth, they create an estrangement between parent and child on a subject of which it is of the utmost importance that there should be frank discussion if the dangers of ignorant immorality are to be avoided, fifth they thrust the child upon incorrect, generally vicious knowledge learned from playmates or friends, and sixth they lead to a suppression of wholesome sex growth and tend to cultivate unhealthy sex practices and frequently lead boys to consultation with that most dangerous branch of quack doctoring, the advisor of sex disorders.

Of the less serious parental lies those to avoid the tedium of detailed explanations are the most common. The present day parent lives on the run and is often tempted to dodge the endless questions of little inquiring minds. Many questions it is true, we could not answer if we took the time and it is safer in such cases to admit our limitations at once rather than tickle our vanity by lying and allowing the child to discover the truth later. It is always dangerous for our children's confidence in us to lie about the price of an article, or the way an evening was spent. They discover the untruthfulness oftener than we guess and their estimate of us suffers in consequence.

One other attitude, vocational morals offer us. When a person is accused in court of any crime he is not expected to give any incriminating testimony. No directly incriminating question need be answered. The court investigates through witnesses and then permits the accused to defend his case. The assumption is always that the accused is guiltless until he is proven guilty. The burden of such proof rests exclusively on the accusing party. In dealing with children parents rarely assume this attitude, yet to do so would save them much anxiety and the child from many severe temptations.

4. *Religious.* More serious in moral effect than the commonplace lies which are the warp and woof of our group life, are the lies and evasions which have come to be grouped about, and in some measure woven into, our concepts of religion. It has been a long time since we believed in the faked oracles of the Greek temples or the witchcraft of medieval saints and demons, but both have left their mark upon our ideas of religion. We still picture and teach our children of the devil as an individual whose influence may determine our conduct and of a God not unlike Zeus sitting out in the Heavens, passing judgment and meting out favors and punishments from His exalted seat. Although there is no substantiation for the belief we teach our children of a heaven of our own devising, and a hell even more lurid. We dare to state these beliefs as facts which sooner or later every child will recognise as " works of faith " and relegate to the scrap heap of childish delusions. Whether he regains them by " faith " or not is shown in the immense falling off of Sunday School attendance after the mental upheaval of adolescence. From the struggle to reconcile the Sunday School teachings of honesty and its teachings of God, the authenticity of the Bible, the devil, Heaven, Hell, and many other concepts held by Protestant churches but few adolescents

survive. Just how serious the effect of such a struggle is upon the individual child cannot easily be estimated. In some cases it has been known to cause a complete reversal of faith and great indifference to the moral standards of the day. One college student wrote rather bitterly that she had lied to her mother lest her unbelief wound the older woman. That such a struggle should be necessary at any period of life is a pathetic commentary on Sunday School methods.

A professor of one of the large eastern universities, on being asked why he did not send his child to Sunday School replied that he had visited several Sunday Schools and found that the children learned so many untruths that he had decided to undertake the child's religious education himself. One has only to attend open-minded any nearby Sunday School to appreciate the justice of his decision. But in his attempt to give his child only the truth he had forgotten the most essential fact in the problem. Religion is a social concept. A child cannot be religious alone but only in his relations to other beings; so he cannot be taught religion alone, but only in modified conduct toward others. We, as parents, have turned over the education of our children in religious ideas to the churches because they are the social institutions which have been dedicated to this service. If the Sunday Schools are teaching untruths it is primarily our fault. The control of democratic social institutions lie with the people who compose them. Anyone really interested in the problem has only to affiliate themselves with some nearby Sunday School organization and help to solve the problem of truthful lesson material. The present day Protestant churches welcome anyone seriously interested in the problem.

At the other extreme of religious struggles over matters of conscience stand such bold deceits as are practiced by the spiritualists and mediums. In medieval times pubescent girls repeatedly resorted to witchcraft to enrich the bareness of their days. In recent years the Society of Psychical Research has exposed many faked mediums but every city newspaper contains several advertisements of mediums who will undertake to get into communication with loved ones long since dead for a dollar or five dollars, as the case may be. Such frauds would be as harmless as the conjuring deceptions of Houdini if it were not that they are so closely interwoven with the religious ideas of the people who patronize them. The inquirer looks upon the medium from a divine source and is often greatly influenced by what the medium says. For some it becomes a real religion and for some a means of livelihood.

VIII. Literature and Lying

How early literature becomes a force in the child's environment depends largely upon the type of home in which he lives. Some parents begin very early to read imaginative literature to their children while in other cases the school introduces the child to the world of books. Whether at two or at six years most children very early become acquainted with the folk lore of theirs and other lands. "Mother Goose" is the classic of the American nursery and is soon followed by Hans Anderson's Fairy Tales and others of the same type.

Ten representative collections were studied to confirm our opinion that all such collections of folk lore contain frequent instances of lying. These covered the Norse, German, Russian, Irish, Indian, Italian, Greek, Jewish and African collections. They were fascinating reading but for the present study offered merely the confirmation of opinion. There was no collection but what contains many instances of lying with no feeling of apology or regret. In fact most of the lies were treated as very clever tricks by which the hero or heroine proved their metal. The only difference in them was that the northern stories were more complicated than the crude Bushman's tales. The Bible offers numerous instances but more often condemns the lie. Jacob's deceit is typical of them all.

George Sand's heroine who bewitched Frederick the Great, Victor Hugo's nun who saves Jean Valjean from Javers with a lie, Barrie's Admirable Critchton who evades what he does not wish to face, Dicken's Phoebe who praises her gullible mistress are all refined examples of the same underlying traits. Rudyard Kipling with characteristic daring devotes fourteen lines of his "Nanlahka" to a eulogy on the pleasures of lying. Shakespeare's characters repeatedly lie. The examples are too well known to need quoting here. It is sufficient for our purpose to note that the so-called classic literature is as replete as Folklore with instances of lying.

Modern literature offers nothing new in the field. Human nature is the same in Kathleen Norris's latest novel as in the Norwegian "Edda," Henry Van Dyke's "Fourth Wise Man" lies to save the life of a child in Bethlehem. Mr. Brittling in H. G. Well's recent successful novel scruples not to evade or lie outright when he deems it expedient. The modern short story as it appears in the popular magazines of to-day is a net work of deceit. Especially is this true since the war has stimulated anew the public's interest in "Spy Stories." The magazines fairly reek with clever and stupid lies. They are so commonplace as to pass unnoticed unless our attention is directed toward them.

Classic and modern literature, however are of but slight interest to the present study. Most children have their morals in regard to lying fairly well established before they read Shakespeare or Kipling. Its chief interest to us is that it mirrors our own moral life. The classics live because they picture life so truly. Modern fiction is voluminous because we like to read about ourselves. Their lesson should strike home and help us to see more clearly the injury we do one another by so much useless lying. The Folklore and Children's stories have an added significance. They too undoubtedly mirror the life of their makers, but they are early introduced into the child's environment and help materially in determining his ideals. Every parent should know what her child is reading and should evaluate and correct unworthy ideals that may have been expressed in the stories.

Poetry also has its place in the child's environment and should add to, rather than weaken his worthy ideals. Poetic license, figures of speech, fanciful statements should be very carefully explained lest they leave a false impression on the child. One literal minded girl of six years became hopelessly disgusted with her teacher because she used the imaginative method in her nature study work and had the flowers and insects talk. Nothing would make the child believe that the good lady was not a confirmed liar, when a word or two from the teacher at the beginning would have placed the whole study on a play basis and have prevented the difficulty in the child's mind.

IX. Parental Implications

The problem of truth-telling in children is essentially a home problem. No one has so early or so great an influence over the child as the parent. The State seldom assumes any direct responsibility over the child until the school age is reached and habits of lying or truth-telling are fairly well established. The school atmosphere has much to do with the encouragement of the maturing habits and hence the parent owes his child an interest, if not a partial supervision, of the atmosphere of the school in order that the ideals she has endeavored to inculcate are strengthened rather than weakened. In the home the first law is confidence. On it rests all the other virtues. When it is weakened or perverted there is no evident reason to the child why he should not use deception to obtain comfort or escape pain. It is only through confidence in his parent that he learns to evaluate a lie.

No instance of child lying has come to our attention that confidence could not have eliminated.

The parents' judgment of any lie should be based on the motive prompting the deceit. Intellectual deflections should be explained and the power of clear thought educated. Emotional impulsions should be studied and as often forgiven as punished. Willful inventions need even greater study and sympathetic care to overcome the tendency. The parents' only hope of helping the child to form habits of honest thinking and acting lies in a sincere attitude of sympathy in their struggle of adjustment to our ideals. Parents, themselves, are sufficiently involved in these same problems to be able to recognize the difficulties and ought to be filled with the spirit of friendly understanding in dealing with the problem.

Above all, the highest possible interpretation should be placed on any statement a child makes. The word "lie" should be charily used and it should never be forgotten that one lie or even many do not necessarily make a "liar." The assumption on the part of the parent that the child's motive was good tends to lift him to the plane of the belief in him and steady his morals for the next temptation.

Parents should ask as few incriminating questions as possible and these should be worded very carefully so that they will not suggest an untruth to the child or put him on the defensive. Fear, it is to be remembered, is the chief cause of lying and much of the responsibility for it lies in the parents' attitude.

Most of the willful inventions seemed to be the outgrowth of a desire for a greater amount of play activity and since parents determine the amount and variety; it is for them to eliminate the temptation by providing ample time and equipment for this all important activity of childhood. Neither musical attainments nor much book learning can compare in wholesome results with a sufficient amount of ingenuous play.

Lies told between children rest chiefly on a perverted ideal of fair play and gentlemanliness. From an ego-centric infant, the child must grow into a socialized individual. The transformation is necessarily slow. Parents can best offer friendly advice and passionate ideals. By well chosen stories, comments and personal example they can lend their influence on the side of fair play, true friendship and the best in social ideals. They can teach the child man's slow development in morals, of his animal forbears, of his primitive necessities and his gradual growth toward perfection in truth-telling as in other phases of living.

They can explain the principles underlying social standards and point the child to sincere appreciation rather than censorious judgments of those with whom he comes in contact. In every person there is something to be admired and the habit of looking for the good in each person or situation would save a host of lies. " Finally, brethren, whatsoever things are true, whatsoever things are honest, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report, if there be any virtue and if there be any praise, think on *these* things."

Vocational ideals can be made living timber with which a noble character is built. Literature can be made to strengthen the love of high purpose. Religion can suffuse the whole with the supreme desire of man for perfection. " All men seek after God lest haply they shall find Him." None need faint by the wayside if they guard their daily task. To parents the task of sincere honesty is paramount. Personal example is worth more than ten spoken ideals or a hundred punishments. The weak must needs anchor themselves firmly to truth if they are to attain mature individuality, so children are steadied and strengthened by it in the conduct of all those about them.

The parent who is *truthful, sympathetic* and *seriously interested* in the problems that perplex her child has little to fear from child lying for the recollection of such a friend is a mighty force prompting the child to better and worthier effort at truth. She who accepts every statement of the child's as a confidence from a beloved friend often entertains " an angel unawares," for the two essentials are present—high ideals and loving co-operation.

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THE USE OF OBJECTIVE CRITERIA IN THE MEASURE OF DRAWING ABILITY

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The child-study movement and the interest in children's drawing growing out of it,—the work of Ricci, Barnes, Maitland, Lukens, Kerschensteiner, Levinstein, Rouma, and Luquet have carried the study of children's drawing to a point somewhat beyond the early objectives. The concern to-day is no longer exclusively with questions of spontaneity, stages of development, drawing preferences. Of the problems which are assuming clearer definition the most insistent perhaps is that of the determination of merit in children's drawing. It has been proposed that well-defined objective criteria might be set up by the careful construction and refinement of a "scale" for the measuring of drawing ability. It is the purpose of the present inquiry to examine the assumptions underlying a proposal of this kind, and to estimate the value of the tentative scale that has been produced.

The term "drawing" has several distinct connotations. It is important to distinguish clearly between at least two of these, for from the failure to do so there results a confusion of idea that handicaps every attempt at intelligent discussion. There is, first, the drawing which is *delineation* or an attempt at delineation. Drawing in this sense aims at indicating the outer boundaries of surfaces, the outlines of objects and parts of objects, at abstracting the edges of surfaces. It is a preoccupation with outlines, and the outline has been defined as "a shadow on the edge." The drawing-act so viewed is an attempt at transcription. Its aim is to substitute for a vocabulary of concrete nouns and verbs an alphabet of lines. It seeks to achieve a relatively accurate correspondence between the depiction and the thing depicted. It is not selective; rather is it categorical and objectively illustrative. It intends to do what picture-writing did. With representative drawing in the narrowest definition of that term it has much in common. As soon, however, as intention, or design (in its original meaning), or purpose beyond the mere recording of fact becomes a motive we have a very different product, still called a drawing, yet as far removed from what we here term *delineation* as the process of thinking is removed from the activity of name-matching. It is a distinction fairly well recognized in other school studies. Reading for thought-getting is no longer confused with word-naming. All the words in the "Ode on A Grecian Urn" may be found in the dictionary; but the lexicographer's law of composition is not the poet's. In the one case there is a single, fixed, commendable but relatively simple aim; the product is a labor of accretion. In the other there is an infinite play of purposes, "a translation from inward to outward," an attempt to achieve perfect accordance to idea; it is an act of composition. Drawing in this second sense can hardly be characterized by a single suggestive epithet for, like literature, it is "an instrument of many stops, meditative, observant, descriptive, eloquent, analytic, plaintive, fervent."

So different are the two connotations of the term and so confusing a failure to keep them distinct, that it may be worth while to consider their implications. It would be well if we had different words; unfortunately the word *design* which might have served as a term correlative to *delineation* has been restricted in its use so that, as now employed, it calls to mind ornamentation, decoration or pattern.

To discover that artists themselves are constantly aware of the distinction one need but turn to the utterances of painters and sculptors. To a painter who exhibited his skill before him, Millet put this question: "It is well, and you can paint.— But what have you to say?" The late John La Farge never tired of warning us that art is not a trade different from others because it requires special skill and is more difficult; to suppose this, he said is "to confuse art with the processes of art." "No genius for painting has ever been given by a knowledge of perspective. . . . The usual belief, the proverbial one, is the belief that we all come to, that rules exist for art, not art for rules. To study any organism we take it to pieces and usually discover its machinery more distinctly in death. A readjustment and juxtaposition of the elements that constituted life does not give life again and make a living unity."[1]

La Farge suggested the kind of questioning that continually goes on in the mind of the artist. "Are these children who are playing in the sunlight or is it a place in the sunlight in which children are playing?" In delineation there is, it is needless to say, no such questioning. Of drawing, particularly of outline-drawing in black on a white ground, La Farge had this to say: "What we apprehend of anything is its full spread, which is always a colored surface, having a given form,—a modelled pattern, not an outline." "The outline is but a shadow of the edge. This is so true, in our usual way of looking at drawings with little but outline, that when the line is thicker, we feel an intention of representation of shadow."[2] "The glories of nature in which we lose ourselves are not the glories of black and white abstraction." What we see first is not form, but lights, colors. Slyly hinting that there is often danger in attaching too great importance to faithfulness of delineation, La Farge remarks: "To some kinds of intellect certain contradictions to their memories of sight will be so important that these contradictions . . . will prove insurmountable. The remainder of the illusion will not take place with them to a sufficient extent to move the entire mind. It may come from too much ignorance; it may come from too oppressive a knowledge of certain facts. We should be troubled by Shakespear's geography, by his statements of historic fact, and the characters he builds, were we not, fortunately for our appreciation of what he meant, bowed down into the right attitude by the pressure of long continued opinion. I think I can remember my professor of anatomy's objection to the Venus of Milo, about whose hips he had much misgiving."[3] Composition, he defined as "our way of looking at things. . . . So that it might be said that we compose in our way of looking at nature, without ever thinking of any copy, any imitation of this appearance of nature in art."

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[1] La Farge, John: Considerations on Painting, 1895, pp. 36, 37.

Vincent Von Gogh in a letter to his brother writes: "Tell Seurat that I should despair if my figures were correct; tell him that if you take a photograph of a man digging, in my opinion he is sure to look as if he were not digging; tell him that I think Michael Angelo's figures magnificent, even though the legs are certainly too long, and the hips and the pelvis bones a little too broad; tell him that in my opinion Millet and Lhermitte are the true painters of the day, because they do not paint things as they are, dryly analysing them and observing them objectively, but render them as they feel them; tell him that it is my most fervent desire to know how one can achieve such deviations from reality, such inaccuracies and such transfigurations."[4]

There is evidently no confusion in the mind of the artists between transcriptive and expressive depiction. It does not follow that we need attach to the two kinds of drawing the same relative importance that they do. But it is imperative that we avoid speaking and writing of the two as though they were one; most important of all is it that we cease thinking of them as of a single kind of activity.

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[2] La Farge, John: Op. cit. p. 102.

[3] La Farge, John: Op. cit. p. 129 *et seq.*

[4] The letters of a Post-Impressionist; Being the Familiar Letters of Vincent Von Gogh, translated by A. M. Ludovici, 1912. Pp. 84, 85.

Some years ago Madame Albert Besnard[5] submitted a collection of children's spontaneous drawings to a jury composed of "artistes, universitaires, psychologues, simples mondaines, philanthrops," and returned with the verdict that children below the age of eight draw better than those between the ages of eight and twelve. One can only conclude that the word drawing is used by her as by Chesneau, to refer to one thing; that the same word employed by Karrenberg, Thorndike, Kerschensteiner refers to an activity quite different.

It seems late in the day and uncalled for, perhaps, to ask, before proceeding to a discussion of drawing abilities, "Precisely what is it that we mean when we speak of good drawing or poor drawing?" It has been generally assumed by writers on the pedagogy of the subject that there are no differences, at least no considerable differences of opinion here; so that one writer assures us that he found children under the influence of this or that system of instruction improving in their work, while another appears with testimony that is flatly contradictory. What is one going to do when Tadd[6] complains that "no more than four per cent of the drawing teachers who were tested could draw," and Mme. Besnard in voicing the judgment of a heterogeneous group of critics tells us that children draw well, but that adults have forgotten how and have ceased to draw?

It seems that one can do no better than to turn for enlightenment to the artists themselves, more especially to those who have committed their judgment to writing, for to these no one (not even that inveterate enemy of critics, Mr. Whistler) has yet denied the right to speak within their province.

"Good drawing is drawing that can not be altered without destruction of its correctness as anatomy, botany, or any other science." So says Wassily Kandinsky. But, he adds, "the artist must have something to say, for mastery over form is not his goal but rather the adapting of form to its inner meaning."[7]

"It is difficult to correct the errors that prevail on the subject of drawing. It is a false idea that drawing in itself can be beautiful. It is only beautiful through the truths and the feelings that it translates. . . . You never think of praising either drawing or style which is truly beautiful because you are carried away by the interest of all that they express. It is the same with color. There is really neither beautiful style, nor beautiful drawing, nor beautiful color; there is but one sole beauty, that of the truth which is revealed. When a truth, when a profound idea, when a powerful feeling bursts forth in a great work, either literary or artistic, it is evident that the style, or the color and the drawing are excellent; but these qualities exist only as the reflection of the truth."[8]

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[5] Besnard, Mme. Albert: Dessins d'Enfants. La Revue Universelle, Aug. 1901.

[6] Tadd, J. Liberty: New Methods in Education, p. 35.

[7] Kandinsky, Wassily: The Art of Spiritual Harmony, translated by M. T. H. Sadler, 1914, p. 105.

Again Rodin says: "If the artist only reproduces superficial features as photography does, if he copies the lineaments of a face exactly, without reference to character, he deserves no admiration. . . . In a word, all the features must be expressive."[9] The purest works are "those in which one finds no inexpressive waste of forms, lines, and colors, but where all, absolutely all, expresses thought and soul." Perhaps the following quotation will reveal the spirit of Rodin's criticism, regardless of whether the thing judged is a canvas by Goya or a child's drawing. "There is nothing ugly in art except that which is without character, that is to say, that which offers no outer or inner truth. And as it is solely the power of *character* which makes for beauty in art, it often happens that the uglier a being is in nature, the more beautiful it becomes in art. Whatever is false, whatever is artificial, whatever seeks to be pretty rather than expressive, whatever is capricious and affected, whatever smiles without motive, bends or struts without cause, is mannered without reason; all that is without soul and without truth; all that is a *parade* of beauty and grace, all, in short, that lies, is *ugliness* in art."[10]

"This form of art-teaching," i. e., drawing, wrote the late Kenyon Cox, "is especially fitted to promote . . . the training of eye and hand and the providing of useful tools for the life work of the student. Drawing as a training of eye and hand is a kind of physical culture. It sharpens the sense, broadens the powers, and stimulates the observation and the intelligence, making of the student a finer and in every way more efficient being than he could become without it. Drawing is also in many walks of life an indispensable tool and I can imagine no walk in which the power of expressing oneself with lines might not occasionally be of the utmost service. Therefore I consider the teaching of drawing a most important part of a good general education."[11] Accordingly there was never any questions in the mind of a student of the late Kenyon Cox about what his teacher would consider commendable or reprehensible in a drawing. A drawing was excellent in precisely the measure in which it was able to reflect a faithful imaging of the subject.

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[8] Rodin, Auguste. Art. (Edited by Paul Gsell.) Translated by Mrs. R. Fedden, 1912, pp. 97 *et seq.*

[9] Rodin, Auguste: Op. cit. p. 130.

[10] Rodin, Auguste: Op. cit. p. 45.

On the other hand, Albert Gleizes and Jean Metzinger complain of "servile repetitions" and condemn draughtsman and painters for being "slaves of the worst visual conventions." "Painting is not . . . the art of imitating an object by means of lines and colors." "Let the picture imitate nothing; let it nakedly present its motive. . . ." In criticism of the work of a fellow-painter, Metzinger has this to say: "Unaware of the fact that in order to display a true relation we must be ready to sacrifice a thousand *apparent* truths, (Courbet) accepted without the slightest intellectual control, all that his retina presented to him."[12] Aimed directly at the correct drawing of the schoolroom and academy is the following: "We know that the most serious infractions of the rules of perspective will by no means compromise the spatiality of a painted work. The Chinese painters evoke space, although they exhibit a strong partiality for *divergence*." But these men, it may be urged, are spokesmen for a special cult.

Mr. George Moore, better known by the world for his realistic fiction than for his painting, wrote some thirty years ago his "Modern Painting" in which he contends that the idea that correspondence to the object is an essential quality of good drawing, is the "blight that has fallen on European art." "The goodness or the badness of a drawing exists independently of the thing copied." The following, from the work referred to may serve to make his meaning clearer. "Looking at this yard of colored print, I ask myself how it is that ever since art began no such admirable result has been obtained with means so slight. A few outlines drawn with pen and ink or pencil, and the interspaces filled in with two flat tints—a dark green and a grey verging on mauve. The drawing of the figures is marvellously beautiful. But why is it beautiful? Is it because of the individual character represented in the faces? The faces are expressed by means of a formula, and are as like one another as a row of eggs. Are the proportions of the figures correctly measured, and are the anatomies well understood? The figures are in the usual proportions so far as the number of heads is concerned; they are all from six and a half to seven heads high; but no motion of limbs happens under the draperies, and the hands and feet, like the faces, are expressed by a set of arbitrary conventions. It is not even easy to determine whether the posture of the woman on the right is intended for sitting or kneeling. She holds a tray on which is an idol, and to provide sufficient balance for the composition the artist has placed a yellow umbrella in the idol's hand. Examine this design from end to end, and nowhere will you find any desire to imitate nature. A line, three or four conventional markings represent a face. No desire to convey the illusion of a rounded face disturbed his mind for a moment; . . . It was no part of their scheme to compete with nature, so it would not occur to them to cover one side of the face with shadow."[13]

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[11] Cox, Kenyon: Museums of Art and Teachers of Art. In "Art Museums and Schools," 1913, p. 59.

[12] Gleizes, Albert and Metzinger, Jean: Cubism, 1913, p. 11.

Writing of the art of Paul Cezanne, a recent critic with whom iconoclasts find little favor gives it as his opinion that "the directness of Cezanne's painting would appeal to anyone, in whatever station of life or ignorance of art, *as a great simple honesty.*"[14] Here is a virtue about which no mention is made in the drawing curriculum.

Testimony of this sort is not lacking, and it all goes to emphasizing an important truth that has too frequently been ignored, viz., that there is not one kind of *good drawing* but many, that we ought to give up thinking and speaking of drawing-ability as of a relatively simple psycho-physical entity and begin to recognize *drawing-abilities.*

For the "measure" of drawing-achievement, Prof. Thorndike[15] has evolved a scale. The author submitted a series of fifteen spontaneous drawings selected from Kerschensteiner's "Die Entwickelung der zeichneriscen Begabung" to a jury consisting of artists, teachers of art, and students of psychology, and education. Each member of the jury was invited to arrange the drawings in the order of merit. Three hundred and seventy-six ratings were thus secured on the basis of which a scale was constructed for the evaluation of similar drawings. Through the preparation and refining of several such scales, some prepared especially for informational drawings, some for representative drawings, and some for decorative drawings, the author believes that objective standards may be secured for measuring the quality of children's drawings.

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[13] Moore, George: Modern Painting, 1893.

[14] Poore, Henry R., A. N. A.: New Tendency in Art, 1913, p. 6.

[15] Thorndike, Edward L.: "The Measurement of Achievement in Drawing," Teacher's College Record, Nov. 1913.

"If a hundred teachers of drawing were asked to state as exactly and clearly as they could the achievement represented by the production of the drawings of Fig. 1,[16] each made in ten minutes with no copy at hand, by a twelve-year-old boy who had the training of grades 1-5 of the New York City schools, many of them would make only such vague, rough statements as "Good," "Fair," "Somewhat above the average," "Satisfactory," and the like. If some of them did give apparently fine estimates, such as "82 by my scale of grading" or "C+ by my scale of grading" or "As good as the work of the thirteenth child from the top in my class of forty," these estimates would not be easily and surely comparable one with another, or with similar estimates concerning other drawings. Each person uses a scale of his own and often a very crude one."

"Consequently although we give in verbal statements and on report cards many millions of measurements of achievement in drawing every year, almost no use is made or can be made of them. A child may learn that his drawings are, in his teachers estimation, better than those of other children in the same class who get lower 'marks;' but he does not know how much better they are. He may be told that his drawings of this week are better than those of last week, but not how much better they are . . ."

"The essential difficulty can be made clear by contrasting the case of drawings produced with that of weight lifted. We can tell just how heavy a weight a child can lift and just how much his gain has been. Any one teacher's measurement of the weight lifted is commensurate with any other teacher's, and any one teacher's measurement for one child with the same teacher's (or any other teacher's) for any other child. We could easily tell whether, age for age, children ten years from now could lift more or less (and, exactly how much more or less) than children of to-day. We could easily compare the results of different systems of physical education upon lifting power. For we have for 'weight lifted' a perfectly adequate scale, starting from zero, and so constructed that any one unit of the scale (pound, ounce, kilogram, or the like) is equal to any other unit. We know what anybody means by 'fifty pounds,' 'sixty pounds,' and the like. Measurements by the scale of weight define the facts in question clearly, exactly and commensurately. For 'merit as a child's drawing' we have no adequate scale; we do not know what 'zero' merit as a child's drawing is, nor have we drawings at hand representing 1, 2, 3, 4, 5, etc., degrees of merit varying by equal steps of difference as 1, 2, 3, 4, and 5 pounds represent degrees of weight varying by equal steps."

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[16] The reference is to drawings in Prof. Thorndike's scale.

The provisional scale is an attempt to meet the need for such a measuring-device. The drawings were submitted to each judge with the request that they be arranged and numbered in the order of excellence. "In ranking these drawings," wrote the author, "do not make any allowance for the apparent age or training of those who drew them, but consider them all by the same standard; rate them for their intrinsic merit as drawings."

It is Prof. Thorndike's avowed purpose "to present a provisional scale by which achievement and improvement in drawing can be measured with somewhat the same clearness, exactness, and commensurability as achievement and improvement in lifting weights." The scheme seems simple enough. We measure spelling-efficiency, penmanship-efficiency, proficiency in the arithmetic fundamentals, why not "measure" drawing-efficiency? I believe that we are to be denied the comfort that such a scale promises, for the twofold reason that it is neither worth having nor possible to secure.

It is not worth having. What service is it to render? What teacher of drawing would send a child to discover his own place in a drawing-efficiency ladder? The teacher who is concerned with drawing-efficiency. But we have no business to be concerned with drawing-efficiency. Who aims to produce a race of illustrators? The artists do not desire it. The world is not hungering for the want of men who can tell stories in pictures. The common school does not aim at producing draughtsmen except when, mistaking the means for the end, it sets out to teach children the little parlor trick of making pictures. All this invites a survey to discern once more the ends toward which instruction in the arts is headed. Why is drawing taught at all?

It is the aim which, more than any other factor in teaching, determines not only the result but the attendant processes of instruction and learning. Class-room procedure is rooted in the reasons that dictate the inclusion of a subject for study in the curriculum. What then are the motives that prompt us to teach drawing in the schools? There is not complete accord here.

Jean-Jacques Rousseau wanted it because it afforded opportunities for combining sense perception and motor activity. "I would have my pupil cultivate this art (drawing), not exactly for the art itself, but for rendering the eye accurate and the hand flexible. . . . I shall take great care therefore not to give him a drawing master who will give him only imitations to imitate. . . . I am aware that in this way he will scrawl for a long time without making anything that is recognizable; that he will be late in catching the elegance of contours . . . but by way of compensation he will certainly contract a juster glance of the eye, a steadier hand, a knowledge of the true relations of volume and form existing in animals, plants and natural bodies, and the more ready use of the play of perspective." In the name of "from simple to complex" and object teaching, Pestalozzi arranged an "alphabet of form"; Calkins, Mayo and Smith prepared textbooks based on these principles. Traces of the influence of this viewpoint still appear in many systems (for example in that of Tadd), and in the persistent tendency to render instruction severely logical. We have seen that not everyone has yet abandoned this aim as the paramount issue. The late Kenyon Cox would still have drawing taught for the training of eye and hand that it affords. We teach drawing to accustom *"the child to observe carefully* what is brought before him, to note the relative importance of the various parts, to compare one thing with another, to estimate distances and proportions, and to recognize how known elements may be combined into new forms." To-day, however, we almost invariably find a statement of purposes that transcends these formal ends while embracing them. It is worth noting however, that even in these modest claims for the value of drawing and in these least aspiring enunciations of its purpose, the conception is dynamic; the center of interest is not the drawing but the *developing* child. Its preoccupation is with the process of perceptual metabolism, not with the drawing product.

But there is a hierarchy of aims. "A universal and comprehensive plan of human education must, therefore, necessarily consider at an early period, singing, drawing, painting and modelling; . . . Its intention will be not to make each pupil an artist in some one or all of the arts, but to secure to each human being full and all-sided development, to enable him to see man in the universality and all-sided energy of his nature, and particularly, to enable him to understand and appreciate the products of true art." "To witness this spectacle (of life and nature) with appropriate emotion is the aim of all culture."

"The real test of value for the masses of our pupils in this department is thus the formation of good taste in selecting, and capacity to enjoy works of art wherever they touch life."

Dewey and Parker hold that art education has a social purpose: the spread of emotional moods that will bring about unified action. The emotional attitude is contagious and is therefore able through the social reminiscences which it provokes to secure concerted opinion and action.

From the educators and the artists we gather that drawing, in so far as it contributes to art education aims at sense training, and at motor training; that it serves as preparation for special activities, and as such becomes a supplementary vocational training—an introduction to the industrial and applied arts; that it should endow the child with some part of his aesthetic heritage through the cultivation of taste and appreciation; that it possesses social values; that it may become a potent factor not only in refining perceptual acumen but that it may be carried on to a higher plane where its aspiration becomes development, intellectual as well as emotional,—where it aims at a mental rather than at an optical awakening. We are given to understand that art is not an industry or a by-product or even a product but a manifestation and a mystery; that being part of the "spiritual output of the racial soul" it may justly claim a position co-ordinate with the other "essentials" of learning, as an indispensable feature in a complete curriculum. Art belongs in the school because it is "a great language for the voicing of greatest things, a language for which there is no substitute; and he who is not learned therein either in its active or its passive aspect is to that extent ignorant, unlearned, uncultured."

Between these aims there is no conflict; there is only a shifting of emphasis. They are all dynamic. In no instance is there a preoccupation with results. *It is always the question of what is to be gotten through drawing, never a question of what kind of drawing to get.* The scale, on the other hand, focuses attention on the result. Its employment would commit us to a way of thinking about children's drawings that is deadly to the spirit and perversive to the form. The employment of a weighted scale can be justified only after it has been established that the work to be judged by the scale is, on its very face, an adequate presentment and a complete history. If a child's drawing could tell us how it came to be conceived, the story of its progress from the moment of its inception to the completion, the measure of the young artist's indebtedness to his neighbors or to his teacher or to a copy,

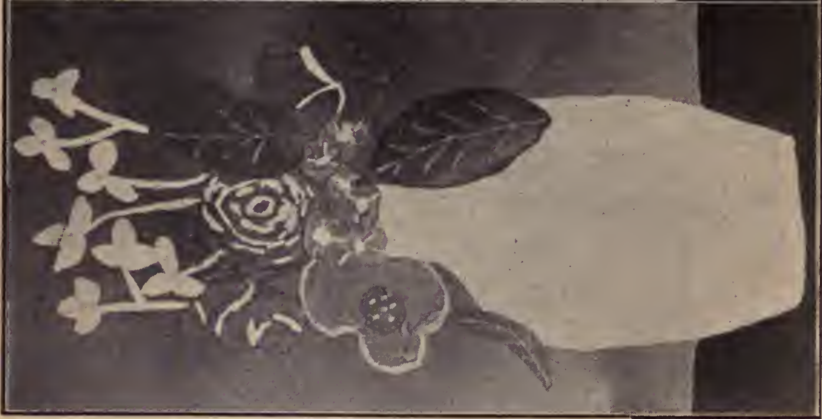

Fig. I

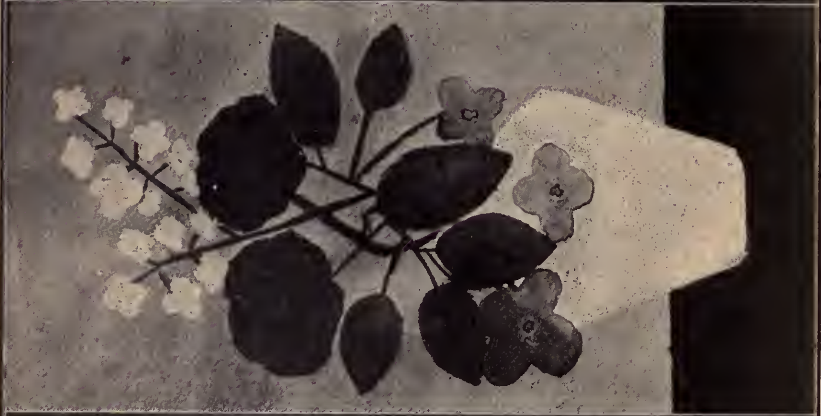

Fig. II

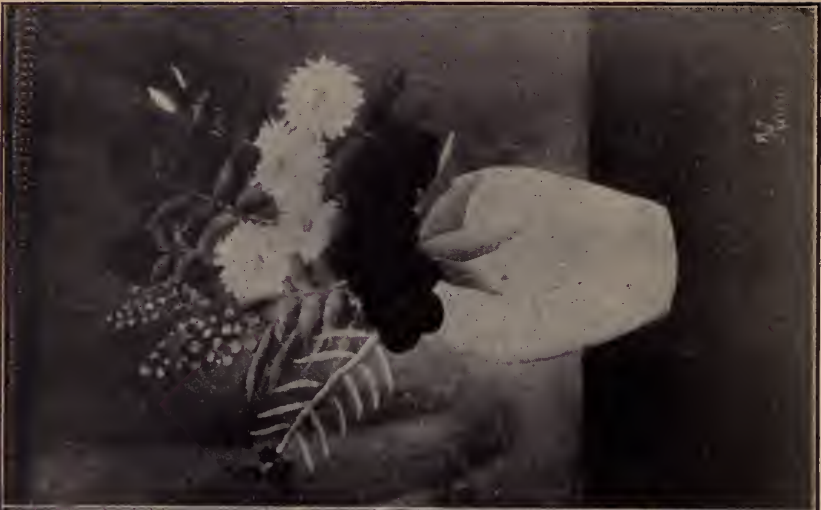

Fig. III

to what extent his achievement approximates his intention, just what the child sought to accomplish, and his own estimate of his success or failure,—if a drawing *per se* could tell us something of these things, the use of an objective criterion for determining merit would require no justification.

About a century ago an English critic dismissed the strange melodies of a budding poet with a curt, "This will never do!" But the judicial mode in criticism has given way to the comparative and historical method. Stated vulgarly, it is no longer permissible to berate a potato for not being a cabbage. And there is no turning back. We look at a finished painter's work and evaluate it in the light of the artist's purpose and with a lively realization of his indebtedness to others. No man in Michael Angelo's day knew some of the facts about pigment and color that to-day constitute the common equipment of youthful academicians. In judging the work of the mature artist one takes for granted the debt to the past. Criticism proceeds to evaluate the painting in terms of the artist's antecedents, in terms of the hour of his appearance and of his avowed intention. This is the comparative method. But in judging the merit of a child's effort we can not safely *assume* anything very definite about the training or the purpose or the influences that may have been operative—that is, we cannot surmise these things by merely looking at the drawing. Here[17] are three still-life pictures. No exclusively objective criterion can help us to estimate their values properly. All three were "done" from the object without instructions or correction. They are not copies of other pictures. In the case of two of them the teacher presented the group, requesting that the children make faithful drawings in color of the objects selected. The third is one of the glories of a master painter, Henri Rousseau. No scale can estimate the three at their relative merit, for their merits are not all stamped on their countenances. What the two children's drawings do not disclose is that it was Rousseau who helped discover for us the beauty of such grouping; that it was he who helped convert us to a new way of looking at these simple things; Rousseau contributed the composition. The teacher composed at Rousseau's dictation, but contributed an act of selection, for the subject was chosen out of a host of possible subjects. The pupil, whether he knew it or not, performed a task "under dictation." But is it to the opportunities that are afforded for this kind of formal training in the performance of set tasks that drawing owes its place in our curricula? If it does. we ought to call it frankly a gymnastic of the eye and hand, and stop solacing ourselves with the delusion that this study is being made to serve nobler purposes, that it furnishes us one of the few opportunities for arousing dormant potentialities, for bestowing a birthright, and for converting in some measure into an artist, a child who might otherwise become a drudge or a drone. For the word *artist,* let it not be forgotten should mean to us what it meant to Rodin, "the man who takes pleasure in what he does."

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[17] Figs. 1, 2, and 3.

We may not any more judge a child by our standards in drawing than in the law court. "If we stop to think of the way in which the intelligence of pupils was judged up to only a few years ago, according to the pedagogic methods that were a remnant of the pietistic schools, we will be able to form some idea. The more intelligent ones were those best able to recite dogmatic truths from memory, and even to-day we have not advanced very far above that level. As a general rule that pupil is considered the most intelligent who best succeeds in echoing his teacher and in modelling his own personality as closely as possible upon that of his preceptor."[18]

Criticism and correction should occupy a larger place proportionally in art instruction. Studies of children's tastes in color, form, and composition at different stages in their growth is what we need. For our unswerving (though narrowing) fealty to the representative ideal in drawing and for assuming to be the sole critics in the class-room, we pay the penalty of not knowing the child's tastes and potentialities. Ruskin held that children should be permitted the voluntary practice of art and that alone. Is it not possible that this voluntary practice may be stimulated more effectively by indirection and suggestion than by direct categorical methods?

What is needed in criticism is not a rigid system but an adjustable scheme with many variants. Expression can not be taught; it can only be evoked, and it will not be evoked unless each lesson is an opportunity for the exercise of individual judgment, for the disclosure of an individual preference, for the accomplishment of a *self-chosen* task. There will be nothing worth criticizing if conditions under which drawings are made are such as to deny this opportunity. We can not afford to treat this study as a prescriptive exercise, and it may be said perhaps that a lesson in drawing which does not permit the pupil to register some personal choice is a lesson in dictation. "The school's whole theory of transmitting art from class-room to adult life will need to be changed. The present belief is that the child can be put through adult ways of doing things and, finally, when he has become a full-fledged member of society, be counted an art-devotee. The futility of such dogma has already been made apparent in intellectual teaching. Its futility is even more obvious when applied to the training of the sensibilities."[19]

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[18] Montessori, M.: Pedagogical Anthropology, 1913, pp. 252-3.

Correction and criticism has concerned itself too frequently with that mythical entity, the "average" child. Experimental investigations, too, being for the most part quantitative in nature have dealt most often with those individuals that constitute the middle bulk of the observation frequency polygon; of the others we learn only that they exist and are in the minority. Yet it is this minority and the singular exceptions whose behavior furnishes the key for the understanding of the rest. "In the school, we have hitherto retained, almost as a principle of justice, a leveling uniformity among the pupils: an abstract equality which seeks to guide all these separate childish individualities toward a single type which can not be called an idealized type, because it does not represent a standard of perfection, but is on the contrary a nonexistent philosophical abstraction: the *child*. Educators are prepared for their practical services to childhood, based upon this abstract infantile personality; and they enter upon their active work in school with the preconception that they must discover in every pupil a more or less faithful incarnation of the said type; and thus, year after year, they delude themselves with the idea that they have understood and educated the *child*."[20]

I have attempted to suggest that the term "drawing" requires definition; that a fundamental distinction should be made between transcriptive drawing or *delineation*, and expressive drawing or *design;* that in the light of those considerations which are responsible for the subject's inclusion in the curriculum, our concern is with the purposeful activity of the latter kind; that the employment of a scale or any other severely objective standard, because its concern is with the drawing product rather than with processes, is at once inadequate and undesirable; that criticism here as in the other arts might profitably adopt the comparative and historical methods.

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[19] Suzallo, Henry: In editor's introduction to H. T. Bailey's "Art Education," 1914, p. viii.

[20] Montessori, op. cit. p. 15.

THE FRINGE OF A UNIVERSITY

By Harlow Gale

Around the border of our American universities with a couple of generations' age there is gathering more and more an honorary collegiate colony, marked by specially interesting psychological traits. Our oldest colleges in New England have long glowed with a halo of literary and historical fame. Harvard is more famed for its life-long sons and neighbors, Emerson, Longfellow, Holmes, Lowell, Motley, Bancroft, Fiske and Adams, than for its own professional academic family. Those beacon lights of the highest types of American culture in Presidents Eliot and White have radiated far wider during their emeritus than during their active official lives. The Yale freshman's first duty of respect and awe has long been to hunt up the homes of Noah Webster, Eli Whitney, the bachelor mansion of the paleontologist recluse O. C. Marsh, and the famous cave retreat on West Rock of the three regicide judges, Whalley, Dixwell and Goffe. The English prototypes of our colleges have each its attendant bodies, some merely reflecting university light, and some being self-luminous.

About our American universities there has been a late accretion of a new genus, the barnacle Carnegiensis. Two varieties can be distinguished: the embalmed and the vital. Those teachers who demand their retirement pension at the earliest legal opportunity, who suddenly drop their life work of education and are never again seen upon the campus, who continue their utter indifference to public and civic affairs, who putter in odd jobs about their homes and arrange their vegetative program of inactivity to draw their pensions as long as possible for themselves and their drone families,—such academic pensioners are embalmed. More probably they consider themselves as having earned a cocoon rest from the duties of instruction in preparation for the heavenly transformation into the eternal rewards.

The sturdy and taut figure, topped by the rewarded and contented face of the retired professor of Latin, is seen outside his premises only when he takes his semi-weekly constitutional over to the city or his faithful Sunday morning and Thursday evening pilgrimage to his red brick Baptist church. A curious spectator of these mechanical actions has never been able to discover any psychological association between these walks and Virgil, Horace, Catullus and Lucretius. He is rather the type of the armoured and impervious personality developed by our Puritan disciplinary educational heritage. For the cosmopolitan breadth, poetic grace and charity, scientific sanity, and the imaginative gods from human prototypes, all so richly embodied in the Latin literature he has taught for a generation, have had no perceptible influence on the teacher's personality and life. He is still the primitive backwoodsman in all social and cultural charms. He reads nothing, he cannot converse, music and art are to him feminine weaknesses, civic and national problems have no interest for him beyond voting the straight Republican ticket. He has done his duty faithfully in making boys study things and by methods they disliked and despised, he has earned his reward, shut up his books for good, forgot his former pupils and colleagues, his final holiday has come, now for the providential pension and a grand loaf!

The always smiling faces of the retired professors of Physics and of Electrical Engineering spread a mild glow over a very limited border of the university. For the physicist, who had long ago confessed that he might just as well have made his living teaching any one of a dozen other subjects, had stuck it out to his pension age limit. The wondrous physical structure of the universe, if it ever had any deep intellectual interest for him, was now quite indifferent. His only continued interest in the humanity about him was his continued zeal in opposing the lending of library books and the use of tobacco on the campus or in the fraternity houses. His electrical comrade in cheerfulness still spoke very softly, but blew his trombone with orthodox vigor in the Methodist Sunday school.

The corpulent president emeritus, who had been a skillful political lay-brother buffer between the departmental ambitions and jealousies of the loose conglomerate of schools and faculties, is now at peace with man and the world. As he had no more plan of education than his plumping down each new building of different architecture on any chance campus spot, so he now takes no interest in the building plan of the enlarged campus or in the modern unified university spirit. After having always laughed at the laboratories and scientific equipment on his annual official rounds of inspection, and shown any serious interest in only the rhetoric department and the Y. M. C. A., he naturally had no bonds of community and sympathy with his former colleagues in education. Some native democratic sympathy with freshmen, to whom he was more accessible than to the importuning and intriguing heads of departments, gave him a rural reputation as a great educator. But he now vegetates at home, lamenting that the world of faith and discipline and the Grand Old Party were going to the dogs, while he consoled himself with the apostle's self-satisfied faith, "I am now ready to be offered, and the time of my departure is at hand. I have fought the good fight, I have finished my course, I have kept the faith: henceforth there is laid up for me a crown of righteousness, which the Lord, the righteous judge, shall give me at that day; and not to me only, but to all them also that love his appearing."

Another variety of the embalmed pensioner is the professor of philosophy. Tall and gaunt, slow and cautious, guided by the diminutive dinosaur head and blinking eyes, the emeritus professor of philosophy came into his position of guidance and trust from a Congregational pulpit. "Safety first" was his motto. He is no innovator, for his type of philosophy and teaching was classically described three quarters of a century ago in Schaupenhauer's famous portrait of Hegel in the preface to the second edition of his "World as Will and Idea:"—That alma mater, good, nourishing university philosophy, which tacks ahead circumspectly laboring on its way, loaded down with a hundred cautions and a thousand back-glances, as it has constantly before its eyes the fear of the Lord, the will of the ministry, the rules of the established church, the wishes of the publisher, the praise of the students, the good will of colleagues, the trend of the day's politics, the momentary pulse of the public, and heaven knows what!" The only occasions when he showed animation or interest in his teaching was in championing the three ideas of pure reason, God, Freedom, and Immortality, against Kant himself. Any trace of opposition from his students on these points put a quiver in his voice and moisture in his eyes with righteous anger. Though he was suspected of personal unitarian tendencies, he always hid these behind the safer shield of orthodox theology. Thus he had missed the beautiful pantheistic serenity of Spinoza's life, the clear vision of Locke, the prophetic keenness of Hume, the sturdy independence of Kant, the virile suggestiveness of Schaupenhauer, the emancipating breadth of Emerson, and the poetic zeal of Royce. All these biographical, psychologically critical, and poetically metaphorical elements in the history of philosophy, which constitute its only lasting value in education as literature and psychology, were hidden beneath the disciplinary scarecrow of apodictic metaphysics.

These hard, mercenary and unsympathetic traits of the philosopher's teaching were naturally concentrated in his retired character. While many severe teachers soften with age, this is not the tendency with professional philosophers. As this typical sample used to grin sheepishly, when asked by his seminar students as to his vacation activities, and reply "Making books," so his pensioned leisure inflicted a long addition to the dreary, utterly uncalled-for Introductions to Philosophy: A Safe Manual for Students, The Philosophic Basis of Theism, Epistemology and Theology, Escatology and Revelation, The Futility of the "Higher Criticism," A Defense of the Three Ideas of Pure Reason, The Physiological Psychology of the Soul: An Apodictic Refutation of Materialism. Books with such imposing metaphysical titles had to be bought by all respectable libraries, though scarcely anyone but timid theological students ever read them. But their author's declining years were comforted by this extra income which he invested in ramshackle tenements out west and by driving hard bargains at a safe distance with his suffering tenants. No one loved this gaunt philosopher, or even respected him; at most he was industrious and thrifty.

In happy contrast to this petty, selfish and mercenary philosopher was the truly philosophic emeritus professor of history, the ideal of the vital type of the university pensioner. He had always showed to his wide academic world a deep sympathy and active aid in all progressive causes. He was the leader of the few professors who took any interest in political and social questions. A new home-rule charter, the control and acquisition of public utilities, a revision of the public school system, state insurance, civil service, the dethroning of the liquor powers, land taxation, socialism, democratic principles versus the monopolistic G. O. P., the gold standard versus bimetalism, the roots and aims of the World War,—all these practical and great causes had found in this historian a wise councillor and righteous fighter. The only religious establishment he had upheld was the small and unfashionable little unitarian church which had become an Emersonian society for ethical culture and a coaling station for all public reform causes. His text books on ancient, modern and United State history, while incidentally keeping his huge and wonderful family free from the nagging cares of academic poverty, were exercising a most liberalizing education on thousands of high school and college students. As can be readily surmised, this very live teacher had been forced to fight valiantly for maintaining his academic position. But he had won his independence and leadership in his department and university by his administrative sense and tact, by his deep learning and broad culture, his catholic openness and fairness, his generous sympathy, and energetic efficiency. In his pensioned leisure he had added a Cincinnatus rôle by venting some of his superabundant energy, along with that of his second crop of boys, on a farm up among the pine trees. But he continued to be the wise councillor and generous friend to many an aspiring instructor, the leader in the brave vanguard of political and social idealists. Sophisticated undergraduates laughed at his baggy trousers and weather-beaten hat; but all within touch of his coruscating mind and magnetic heart honored the righteous and fearless venerable scholar and loved the great man.

On the other side of the block from the embalmed emeritus president, opposite the official mansion of the active president of the university, lives another emeritus president of the vital type. Despite his nearly 90 years his daily constitutional inspires all students by his military erectness and elastic step. Likewise his mental vigor and enthusiasm form a true halo about a genuine scholar. Instead of indolently lamenting over the world's progress, like his emeritus colleague with ten less years, this far younger scholarly spirit worked daily at his classical history of his state. From bushels of pamphlets and newspaper clippings, gathered by the state historical society from the sweepings of the practical political editors, the venerable political economist would sift out the few valuable testimonies to the erratic workings of pioneer politics. How heartily he would laugh, when a visitor found him patiently pawing over this historical dust heap, at the vagaries, political trickery, and pompous rhetorical bluff of the frontier founders of the state! With kindly irony he would sketch their double-dealing, log-rolling, country newspaper harangues, and stagey oratorical kind of primitive statesmanship. "What's in it for me?" the real, tho veiled, touchstone of all practical politics based on competition business principles, and secret favoritism to the few against the laws,—these two fundamental motives of the politicians were shown up with a gentlemanly independence, refined from a sturdy righteousness and a pedagogic humor. This rare academic composite, quite akin to the honored leadership of President Eliot, radiated also from his collected economic essays on the Ethics of Business, Trusts, The Single Tax, Socialism True and False, and The New Economics.

As the moving spirit and first president of the Fine Arts Society nearly a half century before, this pioneer university president's influence for liberal culture had wholesomely affected the whole city, as well as his academic circles. The opening fate theme of Beethoven's Fifth Symphony had been marvelled over from his pocket note book with many a musical enthusiast. The long series of exhibitions of paintings, the growth of the Art Institute and of private galleries lead him to a patient consideration of even such art extremes as the poster craze, the cubists and the futurists. Most of all, his truest type of cultural education showed itself in his generous sympathy and interest in whatever interested his visitor. Instead of being narrowed to his own academic specialty, stolidly or contemptuously indifferent to the rest of the great world, as are too many academic manikins, he would graciously and intelligently respond to any personal subject " from Plato to hog cholera," as his presidential successor scornfully termed such scholarly catholicity.

In the more decorative edging of a university gathers a picturesque colony of academic rebels. As they are also without the parental fold of the Carnegie pensions their material conditions, as well as their intellectual traits, keep them most decidedly alive. The nestor of this unorthodox university fringe may be the state geologist, who was so absorbed in the maze of professional and practical geological problems in a frontier state as naturally to lose interest in the conventional disciplinary grind of teaching unwilling boys and girls. For this neglect, or for lukewarmness to administrative committee meetings, he was engineered out of his head professorship by his scheming subordinate and a *laissez-faire* board of regents. With true scientific magnanimity he quickly forgot this shameful treatment and never referred to it during his succeeding 30 years as state geologist and paleontologist of the state historical society. Most zealously did he throw himself into the exploration of every remotest county of his state. He measured the recession of falls which were thus found to have used some 8,000 years to cut a five mile gorge. Every artesian well, discovery of bones, oil or minerals had a magnetic and instantaneous attraction for him. Particularly was he fascinated by every possible evidence as to our pre-Indian ancestors and the consequent enlarged perspective on the antiquity of man. He would be one of the first pilgrims to any neighboring state where paleolithic human skulls and bones were found. His photographs, lantern slides, and lectures on our prehistoric ancestors were seen and heard with intense interest and respect in many an academy of science or scientific assembly. But such subjects were not considered safe or in good form in his former university. Through his wide-reaching geological journal, which he edited with an associate board and published for many years, and by his faithful attendance and participation in the annual meetings of the A. A. A. S. he kept abreast of the progress of his science and in friendly touch with its best men. And yet his scientific democracy was beautifully shown by his having been the moving spirit in founding a little academy of science with a few natural history enthusiasts among a frontier town's physicians and school teachers. These he had gathered together on his first coming to his new university position and he continued as their leader and inspirer in their modest meetings of self-education for over 40 years. In his beautiful home overlooking his geologic river gorge, and in his labyrinth of private laboratory, dark room, library and study, he lived an ideal life as an independent student of science. He was so much bigger in every scientific caliber than his university-tethered geologists that he was the ideal of his city, state and region as an altruistic, chivalrous free knight of science. Few of the university fringe, alas, discovered this retired, beautiful character and ideal of scientific culture, but to the esoteric few the zeal, bigness and modesty of this independent geologist was a benignant blessing.

Another unorthodox blessing may be a vigorous spinster professor of rhetoric, who was similarly pushed out of the university because she was a leader rather than a driver of young people and took them on wonderful side excursions into real literature and, by means of her own collection of lantern slides, into the world's great art galleries. She was not a Ph. D., had never dug for an underground connection between Chaucer and Nicollette, or counted the aristocratic hyperboles in Kate Douglass Wiggins. But the university had no sooner barred from its campus this strong, original and inspiring personality than she was continually called to lead clubs of working girls, suffragists, art study, Stevenson, Tennyson, anti-tuberculosis, and Americanization. Her sterling enthusiasm and militant righteousness warmed more hearts and formed more helpful association tracts in the cortex of her multitude of hearers than a whole staff of properly accredited university extension lecturers.

As a complement to this spinster's ascetic crusader's zeal for popular education is the fine-grained "old girl" bachelor in the English department who was ostracized by the college for joining the improper free-verse movement and for romantically marrying his vivacious Celtic girl assistant. Although he had been long held within conventional bounds by his concentrated Puritan pedigree, his gradual neglect of church services, and, finally, his mild, open-eyed confession that he could hardly be longer classed as a Christian brought him under academic suspicion. That a researcher in Newman, Meredith, and James should apparently suddenly write free-verse, should spend his vacations consorting with its apostles, should let them encourage his dreamed-of marriage with a girl young enough to be his daughter, and should clandestinely have this poetic rite performed as a civil function in a distant town with only free-verse poets for witnesses and abettors,—this was too much for university propriety. So the banned poetic lovers retired into the shielding shadow of the fringe, lived an idyllic life of study and writing, marched forth at the end of each day for their constitutional and their Bohemian dinner over in the city, and returned joyfully to perfect bliss. Even student curiosity had a secret suspicion, as it watched this modernized Hermann and Dorothea, "*Also gingen die zwei entgegen der sinkenden Sonne,*" and a few admitted intimates of the poetic couple were certain, that these unconventional lovers were living the real life.

Then there was the bird romanticist, "Dr. Tom," who had courted and photographed all the birds of his state during every vacation moment amid a generation's most useful medical practice. His wonderful collection of eggs, skins, and photographs he had gradually given to the university, so that, when he could retire from practice and devote the rest of his life to his beloved birds, the university courteously gave him an honorary loft in the top of the zoology building. Here he built up a wonderful natural history museum of birds, beavers, deer, etc., mainly through the contributions of specimens and money by wealthy sportsmen and amateur naturalists. Thus this most artistic and instructive exhibition in the fringe of the university was due to extra-academic enthusiasm and devotion.

Not all the academic rebels in the university margin are as benignly free as the foregoing from the instincts of self-defense and revenge. There is the ardent young paleontologist whose ideo-motor reactions were so vigorous and unconditioned that a new head of his department delivered an ultimatum,—"one of us must go." But the combative instincts of the struggle for existence in his paleozoic monster ancestors were so concentrated in the student of their fossils and bones that he was a cantankerous fighter for academic freedom. How racily he lampooned the cautious circumspection of his scientific chief. Schopenhauer's pen was mild compared to the paleontologist's tongue. Plenty of commercial jobs were found for his livelihood and boundless scientific energy in surveys of soil, or for oil or minerals; but his morbid delusions of persecution vented itself in his huge fun at ridiculing and anathematizing his former chief and the university authorities who decided which member of the geological faculty "must go."

An American professor of French, dismissed "for the good of the service," turned his persuasive as well as vitrolic tongue and magnetic personality into politics, became one of the highest officials of the state, and had great glee in turning the tables on his former masters by keeping them long at attention and weary with salutes before his official sanctum in the penumbra of the fringe.

A more subtile form of revenge was unconsciously adopted by the psychologist who was dismissed as a "stench in the nostrils" of the president, because of his materialism and lax discipline. With a heavy heart he had put away the wonderful collection of brain slides he had nearly died making in Leipzig, to show somewhat of the inconceivable complexity of the modern histology of the brain. The complete causal dependence of our mental life on this marvelously intricate and delicate mechanism was not questioned by this psychologist any more than by all brain specialists. All the evidence likewise from evolution, animal psychology, child study, fatigue, disease, insanity, old age and death, pointed overwhelmingly to a causal nexus between the brain and mind. Against this the verbal dialectics of metaphysics, the dogmas of theology, the pitiful illusions of spiritualism, the negative results of the best workers in psychical research offered no appreciable counter evidence.

But along with this kind of scientific materialism, which he felt bound to present impartially, the banned psychologist objected strenuously to the usual implied derogatory ethical connotation of materialism. He showed an instinctive retaliation and even spite in showing up the official academic sponsors of idealism, the theological president and the professors of philosophy, as merely verbal idealists, but as practical ethical materialists. For they all took the easiest way to the material necessities and rewards of life by imitation and conformity; they showed no ideals of conduct which required some sacrifice or struggle. In showing his personal contempt for such mercenary professors of verbal idealism and ethical materialism, he was quite priggish and disdainfully superior. His written castigations of orthodox officialism and discipline showed a malicious glee. When a moving picture lecture on the Mawson Antarctic Expedition was given in the university, arranged and financed by "Dr. Tom," this pestiferous psychologist, who happened to have lately gone over all the polar exploration books for their own fascination and for a professional study, took a priggish pleasure in calling attention to the fact that the university library did not possess a copy of Mawson's "Home of the Blizzard," not to mention Scott, Shackelton, Priestly, Amundson, nor the splendid old Sir John Franklin, Parry and their scores of heroes down to Nansen. And he took ironical delight in asking why such heroes and important discoveries are not included in some scheme of education. To clap the climax to many such insults he finally gave his collection of brain micro-photographs and brain works in French, German, and Italian to the psychological and medical departments to show them their ignorance of these wonders, and likewise his extensive library of chamber music and songs to show what the music department was missing.

Yet it must be said in justice to such pestiferous revenge on the official guardians of wisdom that this heretical pyschologist was much beloved by his like-minded friends and by humbler people with whom he was thrown into much contact by his forced humble livelihood. His suite of study and quartet rooms in the fire-proof Harvard House in the umbra of the fringe was a joyous gathering place for all liberal malcontents both within and without the university, where a motley range of lively and jovial discussions on education, philosophy, and science filled the interstices between Beethoven quartets and Brahms sextets.

To keep the university halo more effulgent there is a sprinkling of refined wealth. The son of the nestor geologist has inherited a brilliant geological mind and independence, has married a cousin who is also a geologist in her own right, has become a mining expert, been all over the world as a commercial geologist, and has naturally acquired some rich mining properties. With their artistic as well as scientific tastes they naturally build an elegant villa in the fringe of the university, keep up a most beautiful flower garden, and are extremely generous and hospitable. Many a poor and pinched instructor or assistant professor here gets his first and perhaps only initiation into a genuine aristocracy of mind and art. What meals and nectars are there served by the stately butler! How often the liveried limousine is at the kindly service of academic children or aged parents!

On the next corner about the presidential mansion is also the fine villa of the retired banker, who was a professor of physics in his younger years. He combines a business thrift with far more than the usual conscience towards the contributors of his wealth. As he is happily beyond pressing necessities or occupation, he has become a civic model in all altruistic public work and a wholesome, refining democratic spirit amid the crude and too often petty academic indifference and intolerance.

Unique, too, is the scholarly literary bachelor in his elegant flat, all alone with his great library, his piano and pictures. Before his mother died, from whom he inherited an ample fortune, he taught English literature in the university and brought from Princeton his splendid private library, which he set up in his official college "office." But the janitor and college authorities objected to the books because they filled up the room and caught all the dust. So he moved them to his enlarged flat, when his fortune fell in, and resigned his assistant professorship. So he led a kind of Walter Pater life of study and writing, frequented the Town and Country Club as a golf and tennis enthusiast, was on the list of patrons for every good art and social cause, was the friend and entertainer, like Norton and Gilder, of many celebrities, and, like Fitzgerald, was democratic with his idealized "Posh." While many students laughed at this bachelor gentleman and invented sensational gossip to explain his solitary and aesthetic life, nevertheless he was a potent idealizing influence around the university.

When one gets some such perspective of the fringe about a university it makes more than a picturesque and entertaining scene. Even the embalmed Carnegienses teach a lesson of patience and tolerance with the slow-geared progress of the educational leviathan; while, in spite of the incompatible and uncomfortable academic ejects, this border forms on the whole an advance guard of education. How seldom do we hear of a university dismissal for ignorance or being behind the times. Rebels do not work well together with conservatives. The university, as a close corporation, must have enough harmony and co-operation to work effectively. Some toleration and patience with the advanced spirits is necessary for a university's healthy growth. But if the radicals in thought or teaching methods isolate themselves too far from the conservatively accepted ideas of social, political, and religious life and from the academic machinery of faculty and committee meetings, fraternities and student organizations, convocations and commencements, then the university is quite justified in ejecting such incompatibles. Naturally almost every such eject, however, thinks himself in the category of the progressives who should be tolerated within the university corporation for the leavening of the slowly rising mass of educational nourishment. He consequently nourishes an unpleasant grievance, poses as a martyr to bigotry, makes himself most disagreeable, and nurses all kinds of petty plots for revenge. If he can outlive this malcontent stage, get settled in other vocational ways, and have the means, strength and leisure for continuing his progressive intellectual and aesthetic life, he can be more than ever a leader in sweetness and light.

When an amicable tolerance and understanding can exist between a university and its fringe, there can be a mutual advantage on both sides. The younger and progressive spirits in the faculty can congregate free from all restraint in the fringe, find a vent for their pent-up emotions and radicalism, recite free-verse, smoke and swear, sing or play quartets, compare notes on the rampant educational as well as political forms of extremism. How refreshing to thus hear the volcanic Welsh professor of German, just back from a campaign of loyalty-speaking among western farmers, anathematize with good round English oaths the loyalty lethargy,—to put it mildly and charitably,—of the Scandinavian as well as German Lutheran clergy. Even a dean can smilingly serve to his younger jovial colleagues an art league's generous May Bowl, with California ingredients in place of the original Rhine wine, in the freedom of the fringe's bachelor quarters. And then with what refreshing abandon they will fill a desk or listen during the heavenly Schubert quintet, an ecstatic Schumann quartet, a noble Brahms trio, or a mighty Beethoven quartet. From such relaxation and imaginative flights they can return across the street to their strict academic duties with renewed joy of life and zest. Even the more proper professors have some curiosity, temptation, and respect for these Bohemian art recreations and secretly wish they could do something a bit improper.

For the student life, too, the fringe offers some of the best ideals of cultural living. Just as most professional musicians and writers have no time, energy, or inclination to play music or read poetry for themselves or with their friends, so the professors of literature and music do not read books and make music at home for the pure love of it, where such good things essentially belong. Many students thus get the pernicious idea that books and music exist to be dissected in the class room or for professional public exhibition. Were it not for the fringe homes or bachelor quarters where some of them see Ibsen being devoured in the original and compared with the strength or weaknesses of the German and English translations, find Henry Adams Education and Mont St. Michael and Chartres to be household food for months, look their eyes out at some 2,000 wonderful pictures of L'Italia Monumentale, discover Morley's Recollections on the family reading table as soon as it appears, wonder at the leisure and revival of all the old enthusiasm in again living through all of Emerson and Browning, are astonished to find some 30 books of the charmingly frank, poetic and philosophical school and college master Arthur Benson, are puzzled by academic amateurs sitting down weekly for a whole year to leisurely play through all of Beethoven's immortal 17 quartets, make this first acquaintance with the great song cycles in Schubert's Schöne Müllerin and Winterreise, Schumann's Dichterliebe and Brahms' Magalone as they are sung by college men inspired by the poetry and glorified by the music, but far above all shallow accomplishment and vain display,—were it not for some such spontaneous object lessons of the aims and purposes of cultural education most students would not take away from their university life much better ways of living than they brought as freshmen from their homes. For most professorial homes are also pitifully repressed, barren, characterless and monotonous. If the aim of a cultural college education should be to help to better and richer ways of living, there should be more opportunity to see real people living with joy in the finest accumulations of science and art. Such pedagogical classifications and vague generalizations as the traditional, vocational, and psychological points of view in education do not teach or encourage students to walk instead of motor, to prefer poetry to vaudeville, to love Schubert better than jazz music, to play or hear chamber music rather than fox trot, to read a book for fun instead of marks, to see or read some Shakespeare, Goethe, Schiller, Ibsen, and even Shaw and Barrie rather than get the insatiable melodramatic movie-habit, to make friends on Sunday mornings with the great moral philosophers from Plato and Marcus Aurelius through Spinoza to Emerson, George Eliot, Sidgwick and Royce rather than go to church, to dress comfortably and unobtrusively instead of expensively and flashily, to seek the wonders of knowledge rather than be driven through a text book or a laboratory ritual, to subserviate exercise to the making of strong hearts and minds through a healthy body instead of a vicarious football gorge of excitement and extravagance, to play tennis rather than sit and shout in the baseball bleachers, to vote according to social ideals instead of the Republican and Tammany traditions of special profit, to find vastly more happiness in working than in loafing, to choose work with some worthy aim and result rather than do kindergarten busy work, to cultivate our better instincts of sympathy and helpfulness instead of allowing the beating instinct of competition to make us hard and brutal, to let no necessary vocational or business training blind us to the fearful wastes of advertising and the methods of competition and to the debasing methods of corporation monopoly,—in short to live out Herbert Spencer's motto, "Work to live: not live to work."

With no official status or responsibilities to uphold, but simply to live out the best that it has found in an earnest educational pilgrimage, the fringe has sifted out the best things from the university and thrown away the dust heap. So this college fringe, with its freedom, joy, and congeniality, is a delightful place in which to live. Perhaps,—who knows? —it may some day be officially taken back into the college fold, as a super-graduate school, with the highest possible degree of K. C. L., i. e., Knight of the Contented Life.

CONCERNING ALL DAY CONVERSATIONS

By Margaret Morse Nice

It requires courage to attempt to record everything a child will say in one day, and it certainly takes determination, persistence and hard work to carry it through. I do not wonder that there are so few published instances. M. C. and H. Gale ('00) were the pioneers in this line; they recorded no less than eleven all day conversations of children from twenty to thirty months old. In all of these they worked out the number of different words and ten of them they analyzed with great care. Bell ('03) has the distinction of reporting the largest number of words spoken by children in one day, but unfortunately he gives no other data. I (1917) tried to take the all day conversations of my three and five year old daughters, but did not succeed in recording everything, so my results were confined to the number of sentences said, the average number of words in a sentence and the approximate total number of words. G. C. and Julia Brandenburg ('15 and '19) have done the most thorough and admirable work not only in taking conversations but in working them up. They had the unexampled zeal to take two whole day conversations of their child when three and one when four, analyzing the data in two of these in great detail.

Fired by the Brandenburgs' achievement, we thought we ought to be able to get a complete day's account of our four year old, especially as we were sure she was much less talkative than their child. The birthday of our third daughter, R, came August 9th; I wished to take her all day conversation about a month before as a basis for collecting her four year vocabulary. On July 1st I tested myself by writing down every word she said for half an hour, and when I had achieved that, I saw that an all day's record was possible. We chose July 3rd, as on that day both her father and myself could devote ourselves to the task in hand, her father spelling me in the writing when I had some other unavoidable occupation. The little girl was entirely unconscious of the attention she was receiving.

R had been late in learning to talk (Nice, '18). She had an exceedingly small vocabulary at three and it was not until she was forty months old that she seemed really to make up her mind to talk. She learned with great rapidity from then on, so that by the age of four she had a fair sized vocabulary—1,135 words; this is smaller than any that have been published for this age except Mateer's brother ('08) who had 1,020 words; he also was late in beginning to talk. R's sentences were short at this time and many small words were omitted.

Hourly Record.

The number of words and sentences used each hour are shown in the following table.

TABLE I

HOURLY RECORD OF THE ALL DAY CONVERSATION

Hours	7	8	9	10	11	12	1	2	3	4	5	6	7	Tot'l
Words	902	832	1061	1333	464	925	1052	870	531	444	769	611	715	10511
Average Words per Minute	15	13.9	17.7	22.2	7.7	15.4	17.5	14.5	8.8	7.4	12.8	10.2	11.9	13.4
Sentences	224	227	287	344	121	227	234	215	119	123	219	169	177	2686
Average Words in a sentence	4	3.7	3.7	4	3.8	4	4.5	4	4.3	3.6	3.5	3.6	4	3.9
Questions	34	17	13	33	16	21	17	11	7	34	35	29	31	300

R talked more in the morning than in the afternoon, for in the six morning hours she used 5,519 words and only 4,992 in the seven afternoon hours. The hour that she talked the most was from 10 to 11 when she used 1,333 words while playing with a three year old boy; the other most talkative hours were from 9 to 10—1,061 words—when playing outside with several children; from 1 to 2—1,052 words—when telling a story and working with Montessori colors; 12 to 1—925 words—the dinner hour; and 7 to 8 A. M.—902 words—when she first got up in the morning. The least talkative hour was from 4 to 5—444 words—when she was on a walk. The other two hours in which she spoke comparatively little were from 11 to 12—464 words—and 3 to 4—531 words;—during a part of each of these periods her father was reading to her.

By dividing the number of words each hour by 60 we find the average number of words spoken per minute. Of course she did not talk three times as fast one hour as another; it is rather the relative amount of silence that is indicated. The average for the whole day is 13.4 words a minute; the different hours vary from 7.4 to 22.2.

She used 2,686 sentences, the average number of words in a sentence being 3.9. The shortness of her sentences indicates her retardation, placing her status in skill of speech below the average three year old child. 193 of these sentences—7.2 per cent—were repeated; 20 per cent of Brandenburg's daughter's sentences at three were repetitions.

She asked 300 questions, an average of 23 an hour. Questions comprise 11.2 per cent of her sentences; those of Brandenburg's child were 23 per cent at three, and 20 per cent at four. More than half of these occurred in the afternoon; this differs with Brandenburg's results with the three year conversation but agrees with the four year.

Comparison with Other Children.

In the following table I have summarized the published all day conversations of children two and a half and over; I have also included that of one two year old boy as its large size makes it valuable for comparison with the others.

TABLE II

COMPARISON OF TEN ALL DAY CONVERSATIONS

Author	Child	Age	Total Words	Words Per Minute	Different Words	Per Cent of Vocabulary	Aver. Use of Each Word	No. of Sentences	Aver. Words in Sentence
Gale	Boy, C	2	10507	15.2	805	....	13	.....	......
Gale	Boy, S	2½	9290	13.4	751	52.5	12.4	.....	......
Gale	Girl	2½	8992	13	629	41.6	14.3	.....	......
Nice	Girl, D	3	7600	10.6	....	....	....	2018	3.77
Brandenburg	Girl, G	3	11628	16	859	34	13.7	1873	6.6
Bell	Girl, A	3½	15230	21	....	....	....	.....	......
Nice	Girl, R	4	10511	13.4	731	54.5	14.4	2686	3.9
Brandenburg	Girl, G	4	14930	20	999	24	14.9	1967	7.5
Bell	Girl, B	4½	14992	20	....	....	....	.....	......
Nice	Girl, E	5	10500	13.4	....	....	....	1702	6.17

Just as most of the vocabulary studies have been made on girls, so in these all day conversations boys are sadly in the minority. Parents of boys must come to the rescue and give us data on their sons.

In total words, Bell's two girls lead, the three and a half year child having the most—15,230. His four and a half year daughter and Brandenburg's daughter at four have nearly as many—14,992 and 14,930 respectively. Brandenburg's daughter at three used 3,000 fewer words than a year later, saying 11,620. Close to this are three records in the 10,000 group, my children—R at four years and E at five—and Carl Andrist at two. Then came Gale's son at two and a half with 9,290 words, his daughter at the same age with 8,992 and my daughter D at three with 7,600.

The number of words per minute varies from 10.6 to 20. In the case of different children there are doubtless two factors involved in these variations; first, some children speak faster than others and second, some chatter almost incessantly, while others are silent a part of the time.

The number of different words is known in six cases; it varies from 629 of Gale's daughter to 999 of Brandenburg's daughter at four.

The percentage of the total vocabulary used in any one day is an index to the child's maturity; the younger the child, the larger, as a rule, will the percentage be. Gale has published the most complete series of all day conversations of any child. His daughter used 96.3 per cent of her total vocabulary at 20 months, 60.7 per cent at 21 months and 43.1 per cent at 22 months. The next two times are an exception to the rule for she used 48.6 per cent of her vocabulary at 23 months and 53.4 per cent at 26 months. However at 30 months the proportion is the lowest of all—41.6 per cent. Brandenburg's daughter shows the typical development, for she used 34 per cent of her vocabulary at three and 24 per cent at four. R's high percentage—54.5—is another indication of her lack of development in speech matters. This is almost the same as Gale's boy of two and a half; indeed R's figures are more similar to his than to those of any of the other children; their total words, different words and percentage of whole vocabularies are nearly the same, while the rate of words per minute is just the same.

The average number of times each word was used shows more uniformity than any other item; it varies from 12.4 to 14.9 in the six cases in which it can be calculated.

As to the length of sentences, the five children for whom we know it, divide themselves into two groups. D at three and R at four used short sentences—3.77 and 3.9 words respectively; while Brandenburg's child at three and four and E at five used sentences of 6.6, 7.5 and 6.17 words respectively. D ('18) was slow in beginning to talk and had not advanced at this time as far as the average three year old.

The Parts of Speech.

The distribution of the different words of her all day conversation is shown in Table III and also the percentages of the parts of speech in her whole vocabulary.

Forty-eight of these nouns were proper nouns and 10 were nonsense or words repeated after some one else; 33 of the verbs and 3 of the adjectives were inflections, while 7 of the interjections were nonsense, so that only 619 of these words were counted in making up her four year vocabulary.

The parts of speech of the different words follow in general the proportions of the parts of speech in the whole vocabulary of the child. Nouns were less used, while verbs, adverbs, pronouns and prepositions have higher percentages in the one day vocabulary than in the whole vocabulary. These percentages are much the same as those of Brandenburg's

TABLE III

PARTS OF SPEECH OF THE DIFFERENT WORDS

	Number	Per Cent	Per Cent in Whole Vocabulary
Nouns	302	41.4	52.2
Verbs	192	27.6	23.2
Adjectives	90	12.4	11.2
Adverbs	69	9.5	7.6
Pronouns	32	4.3	2.9
Prepositions	18	2.5	1.6
Interjections	14	1.9	0.4
Conjunctions	3	0.4	0.9
	731	100.0	100.0

child at four. Gale's son and daughter at two and a half used similar percentages as R, except that their nouns were higher, being 47.8 and 48 per cent; and their adverbs were lower—5.5 and 6 per cent.

The proportion of the parts of speech of the total words of her day's speech are decidedly different as shown in Table IV.

TABLE IV

PARTS OF SPEECH OF THE TOTAL WORDS

	Number	Per Cent
Verbs	2966	28.2
Pronouns	2328	22.1
Nouns	2040	19.5
Adverbs	1676	16.0
Adjectives	772	8.6
Prepositions	585	5.6
Interjections	97	0.9
Conjunctions	47	0.4
	10511	100.0

It will be seen that she used more verbs than any other parts of speech, more than a fourth of all her words denoting action. Over a fifth were pronouns and less than a fifth nouns. The next largest division was adverbs, comprising about a sixth of her total conversation and after them adjectives which she used only half as often. It is interesting and rather unexpected to find that half of the 10,000 words this child used in one day were verbs and pronouns. We should have data on older children and adults for purposes of comparison.

Each word was used on an average 14.4 times. There is great variation, however in the number of times the words of each part of speech occurred as shown in Table V.

TABLE V

AVERAGE NUMBER OF TIMES EACH WORD WAS USED

Pronouns	72.7	Verbs	15.5
Prepositions	32.5	Adjectives	9.0
Adverbs	24.5	Interjections	7.0
Conjunctions	16.0	Nouns	6.8

In this category pronouns lead, since each was used on an average the surprising number of 72.7 times. Prepositions and adverbs were also used very frequently, 32.5 and 24.5 times respectively. Conjunctions and verbs come in a middle class being employed about the same number of times as the average for the whole vocabulary. Adjectives, interjections and nouns were used the least often, the average use of each noun being less than a tenth of the average use of each pronoun. Of course this means that with pronouns, prepositions and adverbs, relatively few words were used many, many times, while with adjectives and nouns a wide variety of words were used a few times each.

Much the same thing is evident in the proportions that her one day vocabulary bears to her whole vocabulary as shown in Table VI.

TABLE VI

PROPORTION OF ONE DAY WORDS TO WHOLE VOCABULARY

Parts of Speech	Per Cent Used in One Day	Parts of Speech	Per Cent Used in One Day
Prepositions	100.0	Interjections	70.0
Pronouns	96.9	Adjectives	69.5
Adverbs	79.3	Verbs	60.3
Conjunctions	75.0	Nouns	41.2

She used her whole stock of prepositions during this one day, 97 per cent of her pronouns, four-fifths of her adverbs, three-fourths of her adjectives, three-fifths of her verbs and two-fifths of her nouns. Again we are impressed with the lack of variety in the prepositions, pronouns, adverbs and conjunctions used by this child and at the same time the wide range of variety in her nouns.

The Most Used Words.

The accompanying list gives the words that R used more than 100 times during the day.

TABLE VII

THE WORDS USED OVER 100 TIMES

I	979	Baby	170	Do	121
Don't	247	No	161	Not	119
To	230	Get	154	This (adjective)	117
Mamma	215	Yes	150	Me	116
Want	210	See	139	Going	112
This (pronoun)	186	Here	126	On	103
You	175	It	124		
Did	175	My	123		

This list includes 6 pronouns, 7 verbs, 4 adverbs, 2 prepositions, 2 nouns and one adjective. No conjunction nor interjection were used more than 20 times. In a similar list of an average four year old child probably, "the," "a," "is" and "am" would be represented.

The child's egocentricity is well exhibited in her use of "I" nearly one thousand times—once in every 10 words, while more than one-third of her sentences (36 per cent) had "I" for their subject. She used the various forms of the first personal pronoun 1,243 times, making their ratio to other words one to every 8.5. The second personal pronoun gives us a different picture; there are only 210 uses, which means one in every 50 words. In the case of Brandenburg's daughter the ratio of first personal pronouns at 40 months was one to every 13.5 words and at 52 months one to every 15.6. The second personal pronoun was used once for every 31.6 words at 40 months and once for every 29.8 words at 50 months. Here again we very much need further data especially on older subjects.

The One Hour Conversation.

The results with the all day conversations of my other children were not complete enough to enable me to analyze them as I have done with R. Yet it seemed worth while to compare an hour's conversation of the three children. Choosing as a standard R's first hour in which she said 902 words, I took enough sentences from D's and E's all day conversations to get this same number of words; with R and E the time was one hour, while with D it was somewhat more as she said fewer words in an hour than her sisters. The conversation of each child embraced similar activities, dressing, breakfast and play.

In comparing the percentages of the parts of speech of R's one hour and all day conversations, we find a striking agreement in the proportions of the total words, the difference varying from 0.1 of one per cent to 2 per cent. There is much less agreement in the proportions of the parts of speech in the different words; indeed there is a similar relation between the one hour and one day vocabulary, as there is between the one day and one month vocabulary. That is, the proportion of nouns is too low, while that of verbs, adverbs, pronouns and prepositions is too high. Thus it seems that with the total words, one hour gives a good prophecy of the all day conversation, while with the proportions of the different words its value is much less definite.

TABLE VIII

Parts of Speech of Different Words of One Hour's Conversation

	Numbers			Per Cent		
	E	R	D	E	R	D
Verbs	107	59	66	34.1	30.7	34.0
Nouns	77	59	55	24.1	30.7	27.8
Adverbs	34	26	25	10.6	13.4	12.7
Adjectives	52	23	23	16.2	11.8	11.8
Pronouns	25	17	17	7.8	8.8	8.8
Prepositions	13	6	7	4.1	3.1	3.4
Conjunctions	7	1	1	2.2	0.5	0.5
Interjections	3	2	2	0.9	1.0	1.0
	318	193	196	100.0	100.0	100.0

TABLE IX

Parts of Speech of Total Words of One Hour's Conversation

	Numbers			Per Cent		
	E	R	D	E	R	D
Verbs	251	266	208	28.1	29.6	23.1
Pronouns	206	208	201	22.8	23.1	22.3
Nouns	143	176	156	15.8	19.4	17.3
Adverbs	93	126	167	10.2	14.0	18.6
Adjectives	124	68	84	13.7	7.6	9.3
Prepositions	57	41	64	6.2	4.5	7.1
Conjunctions	19	3	6	2.0	0.3	0.7
Interjections	12	14	14	1.2	1.6	1.6
	905	902	900	100.0	100.0	100.0

In examining these tables it must be remembered that E was five and had a vocabulary of 2,502 words, that R was four with a vocabulary of 1,135 words and D was three with a vocabulary of 856 words. D and R are most astonishingly alike both in the number of the different words and in the proportion of the parts of speech With the same number of total words their different words are 193 and 196. E being an older child and much more advanced in the technique of talking had a far greater choice of words—318,—which is 165 per cent of R's number. E used each word on an average 2.8 times while her sisters used each 4.7 times. D and R are also very similar in the proportions of the parts of speech; indeed, in half of them they are absolutely alike—pronouns, adjectives, conjunctions and interjections—while adverbs and prepositions differ only by one.

E's greater maturity is perhaps shown most strikingly in the matter of conjunctions—always a late acquisition; she has seven while her sisters have only one each. She has twice as many adjectives and prepositions as they. Adjectives are a specialty with E; she has a larger proportion of them in her vocabularies than most children. Proportionately E has fewer nouns and adverbs than her sisters, almost as many pronouns, about the same verbs, more prepositions and conjunctions and many more adjectives.

When we come to the table of the total words, we find less similarity than with the different words. Yet all agree in giving verbs first place and pronouns second. With E and R nouns are third in order, but with D they are fourth, being outstripped by adverbs which happen to be D's specialty. Adverbs come fourth with R but fifth with E where their place is usurped by adjectives. With R and D adjectives are fifth in order, being used only half as often as adverbs. All children are alike in giving sixth place to prepositions. Pronouns are the most uniform with the three, varying from 22.1 to 23.1; while adverbs show the greatest divergence, from E with 10.2 to R with 14 and finally D with 18.6.

In comparing the sixteen words used most often in R's whole day conversation and in one hour we find that fourteen are the same. The two of the hour's talk that do not correspond " going " and " me " are however among the twenty-one most used words of the all day's conversation. Therefore in her case one hour gave a fairly good index of the whole day. The words most often used by the three children during one hour are shown in the following table, and also the average number of uses of the eight words that were common to all.

Eight of these words were used by all three children: I, Mamma, to, it, my, want, you and don't. Two words in each list were used by one other child and six were individual. The words used by two children and the average number of times used are: "a," 20; "here," 16.5; and "me," 13.5. Several of E's words show her advanced status in comparison to her sisters; "the," her second commonest word, "is," her

TABLE X

The Words Most Often Used in One Hour

By E		By R		By D		Those Used in Common	
I	56	I	90	I	69	I	72
The	30	Mamma	35	My	36	Mamma	24
To	23	This (pronoun)	24	Want	31	To	23
It	23	Baby	19	It	31	It	22
Mother	21	To	17	Father	31	My	19
You	20	Don't	16	Yes	30	Want	18
Is	19	You	16	To	29	You	17
Me	15	Here	16	A	29	Don't	13
What	14	Want	13	Up	22		
My	11	Going	13	There	18		
Don't	11	Me	12	That (pronoun)	18		
She	11	See	12	Here	17		
Am	11	Did	12	Mother	16		
A	11	It	11	You	15		
And	11	My	9	No	14		
Want	10	Get	9	Don't	13		

seventh word, “ am ” and “a.’ Neither of the younger children used “ the ’ at all and R seldom used “ a.” They usually omitted “ am ” and “ is.” E used “ what ” as a relative pronoun instead of “ who,” “ which ” and “ that;” D did the same only less often for her sentences were less complicated, while R rarely used any relative.

The parts of speech of the eight words most commonly used by all were 1 noun, 2 verbs, 4 pronouns and 1 preposition. E's words were divided thus: 1 noun, 4 verbs, 7 pronouns, 2 adjectives, 1 preposition and 1 conjunction. R had 2 nouns, 6 verbs, 6 pronouns, 1 adverb and 1 preposition; while D had 2 nouns, 2 verbs, 5 pronouns, 1 adjective, 5 adverbs and 1 preposition. Perhaps the most striking difference in these lists is E's entire lack of adverbs, whereas D had five. R had no adjectives and D only two verbs.

E used “ I ” 56 times or once in every 16.2 words, while R used it 90 times, once in every 10 words. D used it 69 times, but omitted it 18 times when it should have been used, as: “Ha' (have) my ap'on on.” The addition of these makes 87 uses or once in every 10.5 words. D used “ you ” once in every 60 words, R once in 56 and E once in 45, which is just the development we would expect.

Such an array of facts and figures needs a little enlivenment, so I will conclude with a few samples of what the children really said.

D. Three years old. Playing with toys.

Donkey goin' in autobile. Dat two toad. Goin' get dinner. Goin' come in hout (house). Big toad come to dupper (supper). 'Ner big toad a'k him to dupper. He did go adeep (asleep). Yet (yes). Goin' in autobile.

I don't like 'ou to do dat. Dou naughty ding.

Dat where bire (fire) id (is). Cookin' and cookin' again. I'm g'ad at him. Look at I did. Dee (see) dere. Dat b'oken. Dee dere. Cow gettin' out. No. An' hen goin' come out. Goin' on a walk. He goin' on a autobile bip (trip). Oh no. Look at dat. Dat a little bed. Bow-wow goin' to deep.

R. Four years old. In bed and being urged to go to sleep. (Sweet Cherry was an imaginary friend of wonderful prowess.)

Feet Cherry do 'tay up very late. Feet Cherry more bigger anybody in her land. She got pig name Pink and Blue. Yat baby pig she did get out. She did get out pen. She won't run away. She nice baby pig. I don't like any nap. Feet Cherry don't take any nap any more. Do you know fut (what) Feet Cherry do? Feet Cherry and me not 'faid lion. Feet Cherry got some lion. I not want any lion come here.

Feet Cherry do s'eep outdoors. In rain she do. She do in shnow. You know fut Feet Cherry do?

P'e get down yose dishes. Can't you get down yose dishes? I want yem *today*. After yis day tomorrow? You do say it today ev'y time. When tomorrow come?

I can't go right to s'eep. Baby do wake me up ev'y time. Can I wake up ev'ybody? Fy (why) do rabbit wake up ev'y rabbit? I want wake up somebody. I do. I don't. I hungry. I hungry. Yes.

You know fere my sword is? Can I get my sword? Don't. No.

E. Five years old. Visiting in her mother's bed in the morning,

Why, I tried to get him. We went under a bridge and over a brook and under a bank and when we came back I tried to catch the frog and a great big beetle with claws. I didn't like the beetle. No, I only caught the toad. He hopped back and forth from one hand to the other. He was a young toad,

I don't like to pick up grasshoppers. They're too wibbely-wobbely. They aren't pleasant to pick up.

I don't care for paper dolls. I like animals better.

"Your noble children," why did Tabaqui say that? When they were just born, they weren't brave, were they? I don't think any wolf was that way.

(To her baby sister.) Oh, you're making all little cunning faces. What is it, little sweetheart? She's bearing her weight against me. Little mischief feet! I call them little mischief feet.

You little funny-fun! You little kiss-heart!

Oh, you little bright eyes! Why do you stop and laugh at me? Mother, was she laughing at me? I like to have a baby laugh at me.

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SCHOOL ADJUSTMENT AND THE PSYCHIC ENVIRONMENT

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The present paper is an outgrowth of a study of the factors which help or hinder the child's adjustment to the school. The numerous "disciplinary cases" with which teachers and superintendents have to deal, "school mortality" and retardation bear witness to the fact that a large proportion of the school population never makes this adjustment. Significant as these symptoms are, they do not represent school dissatisfaction to its fullest extent. Experience with the so-called normal child, the child who succeeds in adapting himself to circumstances, reveals the presence of considerable minor irritation, and dissatisfaction due to disharmony between the child's needs and his school relations, which is not recognized under a system which is desirous of maintaining averages rather than developing potentialities to their fullest extent. If, however, the aim is to develop and utilize all the ability latent in the normal and subnormal children, those factors which hinder complete self-realization and use of individual capacities, whether manifest or latent, must be discovered and removed.

More accurate estimates of individual ability, better grading and classification, genetic adaptation of the school work in method and content, designed though they be, to facilitate adjustment, do not go to the root of the matter, for though they may make adjustment possible they do not necessarily bring it about. The chief element in the process of adaptation is the child. History is replete with examples of men who learned under the most adverse circumstances. However crippled the method, or distorted the theory of development determining the educational procedure of the time, there were always some who made shift to profit by it. These were people with a natural attitude for scholastic pursuits or people animated by a purpose whose consummation required the knowledge and abilities imparted by the schools, or were thought to. In either case there is no conflict. The outer and inner demands are at one; effort and energy are focused on a single objective; there is a minimum of that emotional stress produced by a conflict of interests with a maximum of satisfaction. Under these conditions the individual may be said to be perfectly integrated, and because his school tasks, being based on fundamental needs, tap the source of energy, the instincts and emotions, he may be said to be truly activated.

Significant in helping or hindering integration is the influence of the home and the attitude of the parents. Jung has shown that the complexes of the daughter are similar to those of the mother; that the former takes the same attitude to certain emotionally toned experiences as were taken by the mother under similar conditions. Williams has called attention to the significance of the parental interests and occupations in directing and shaping the child's interests, giving point to the fact that a large part of the incentive to study comes from the approbation which the mother or father gives to the successful school child, in addition to the fact that children whose parents are intelligent and interested in current thought, or are workers with ideas rather than with objects, have less difficulty in adjusting themselves to their school work, express themselves better and make better use of their gifts than children less fortunately environed. Superiority may indeed be due to hereditary influences, but it undoubtedly manifests itself more easily and more completely because of these environmental advantages.

These influences not only aid the revealing of innate qualities but they also give direction to the child's energies. The new psychology has demonstrated the fact that choice of profession is based on a deep, personal need, and is a significant expression of the personality. The same need may, however, be satisfied in various ways as may be culled from psychoanalytic literature. The child with sadistic tendencies may very naturally gravitate towards the trade of butcher; the same needs will be satisfied, however, if he becomes a surgeon. Obviously, the child of intelligent parents is likely to become a surgeon, while the child of a manual laborer, unless he have unusual persistence, and standards, is likely to become the butcher.

This is, however, only a theory based on another theory. Emphasis should be placed on the fact that the child follows in the footsteps of his parents, perhaps not in detail, but in general, through imitation and the force of environment. Their approval of activities which most nearly approach their own, stimulates the child to further efforts in the same direction. The reverse side of the shield is that with which the teacher has to deal, for we are as yet more interested in the cure than in the prevention, in the defective rather than in the superior. The group of cases presented below are cases actually found in the school-room, having been brought to notice as problem cases. These children are problems, because in a positive view of education the child who is not realizing himself completely is the child whose education is a failure. These are normal children who are working at submaximum efficiency because in each case some psychic factor in the environment militated against integration of the child's personality.

Case 1 was recommended for investigation because of poor conduct. He does not respect his teachers, is indifferent alike to encouragement and reprimand, is perpetually tardy, and refuses to take any responsibility for his misdeeds.

The boy is normal in height and weight. He is alert and active. Attendance at school is regular, denoting the absence of colds and other ailments which cause sporadic absence among school children.

Psychological tests show that the boy is normal mentally, but not above age. There are no lacunae and no marked abilities. Extra-scholastic pursuits betray more than average development. He is ten years old, but reads and understands the daily papers, and is conversant with current events, as discussed in various periodicals. His parents have been in the habit of reading to him from these publications and from standard novels suitable for adolescents.

The parents of this boy are interested in civic affairs; the mother is a prominent club woman in the fair-sized city in which she lives, and the father has held political office of a legal nature. They are interested in the school which the child attends, for personal reasons, and because it is unique in its policies and aims.

Thus far the influences surrounding the child seem entirely favorable. Closer investigation, however, reveals the fact that the attitude to the school is intensely critical, and that the child has listened to discussions of the school distinctly derogatory to it, and to analyses of the teaching staff in which the personality and education of its members were held up to ridicule. The child's very mediocre school performance has been assigned to the inadequacy of the school and personnel in meeting his needs.

This attitude has reacted on the child in a very natural way. He does not have the usual childish faith in his teacher; he realizes that it is quite safe to criticize her, and to lay the blame for his difficulties on her. He, like his mother, lays the responsibility for his progress on the teacher. He is, as it were, a disinterested observer of the whole situation.

Since it was not possible to change the mother's attitude, which is an integral part of her personality, all effort was concentrated on altering the relation between the child and his teacher. Work within his ability but sufficiently difficult to command thought, was assigned in units small enough to be completed well within a given time. He was made to understand that its completion was a requirement and not a request; and was held strictly accountable for its completion. He was no longer complimented for the things which he did well naturally, but for the difficulties he attempted to surmount. The situation was thus changed from one in which his young teacher sued for his approval, to one in which he had to win hers and that of his classmates. Her new attitude commanded his respect, and made her approval worth winning.

Case 2. G. H. is a persistent problem in school. His school work is accomplished at half the normal rate. He is considered a hopeless case by the teachers, not because of deficient intelligence, but because of external factors which they cannot overcome.

Attendance is very irregular. The boy is normal in height and weight. He says he is never ill. He was dirty and ragged but has improved immensely since first seen.

Irregular attendance was found to be due to the boy's working at odd jobs, which when they lasted over the week end were not interrupted by attendance at school. The boy's parents are working people; the father works steadily at some kind of manual labor. There are three children, one of whom is a teacher. The family are poor, though not poverty-stricken. Why then does G. neglect school for work?

On investigation we find that G. is practically self-supporting and has even a little money on hand; in fact, he is on the same economic basis as his father. Nor is his wealth attained through drudgery. Conversation with the boy reveals how vivid and adventurous his life is. He is constantly with grown men, works with them, teases and is teased by them. He assists furniture drivers and accompanies them on over night trips on the motor trucks. When seen he had but lately returned from a trip up the river on a barge. He is planning to ship on a schooner bound for Hawaii during the vacation. His manner fits his own conception of a man of the world, though in his boyish liking for his teacher, and his avidity for approval, he is entirely a small boy.

How pale are the joys of school against such an existence; how feeble its rewards when compared to financial independence and plenty of ice cream! How useless the approbation of the teacher in the face of these, if his idol, his father, has no education, and his mother is too glad of the relief of providing for him, to discourage his working!

Can the school hold such a boy and should it try to? If the boy is likely to feel the need of education later in life, first-hand experience and actual life-contacts such as he is getting now will undoubtedly be invaluable to him, and he will learn the faster because the need of knowledge has been actually felt. There is grave danger, however, that he may be one of those men described by Jack London, one of the untrained who live by their physical strength and endurance in blind alley occupations until strength and endurance give way to the early senescence of overtaxed capacities, and they are obliged to join the ranks of the unemployable.

The next two cases are interesting because they are the product of the same influences, and show very similar reactions.

Case 3. The older boy is reported as "doing absolutely nothing in school," is thirteen years old and normal as regards physical conditions and social reactions. His intelligence quotient is 107 on the Stanford Scale. Other tests involving comprehension, abstraction and practical judgment are well done. In mentality, he is well in the adolescent period.

Conversation with the boy evinced his discontent with the teacher, who, according to his account, was unfair and too strict. He did not like his work because he thought it would be of no use to him later. He gave the impression of a boy who is doing his very best against odds, and is seriously viewing his education as a preparation for life. Further inquiry brought out the fact that this boy had never put forth any effort, although various teachers had tried to stimulate him, and that he always had a good excuse for his own failures. Indeed, this facility in excusing himself convinced the investigator that his failure was not due to lack of ability but to absence of motivation.

Examination of the home conditions and parental attitude gave the following from the mother: "G. is the result of an experiment, and it has failed." "Finis" adequately describes her attitude. The child is disobedient at home, but he is never held accountable for his acts. Privileges and treats occur automatically and are never the reward of merit. School success would profit little by it if they were, as in the mother's opinion, "It doesn't make any difference what a boy does in school. If they are going to be successful as men, they will get along without schooling."

It is undoubtedly true that many a child of mediocre school attainments has achieved much in later life, if only for the fact that his energies and interests have been deflected from the school in the direction of his talents. This boy, however, says he wishes to be a mechanic, but has never finished any contrivance he is interested in, or gotten past a difficult point with it. He is no easier to motivate in subjects demonstrably having a bearing on this than in any other. The conclusion, therefore, is evident. This boy lacks the power of applying himself to any difficult task, because he has never needed this power of application to gain anything desirable. The approval desired had come to him automatically, or through his ability to avoid blame. The idea that good work in any task attempted is inherently worth while, has never been fostered, nor has school success, as a means to an end, been given any value. This being the case, he has taken the path of least resistance with the result that he is a dismal failure in school.

Case 4. This boy's brother gives a picture of the inception of the deteriorating process which went on in him. S. is seven years of age, normal physically, though listless and slow in his movements. He is truly superior in intelligence, in spite of the slowness of his reactions.

The teachers report that he is difficult to motivate, and believe him to be sub-normal in intelligence, as he is overdue in all school subjects, especially reading.

The child was tested and told that he was a bright boy and should be at the head of his class. His teachers were advised to apportion his work for each period, emphasizing the fact that he would be expected to finish it in the time allotted, since they knew now (since the test) that he could do it. Improvement was noted at once, as was to be expected since the child was young, and therefore, highly suggestible. The extent to which he had been soldiering was revealed by the fact that his rate of reading rose from half a page a day to ten pages a day. Some changes in his home life were suggested, as he had been retiring at nine or ten, and was sharing the social life of his parents. Since he was no longer sleepy and tired in school, it was possible to hold him to the requirements. He has since been making rapid progress under the stimulus of his own success.

Case 5. Howard is a boy of 10 with an intelligence quotient of 143. He has no difficulty with any subject, but progresses slowly because he is unwilling to apply himself. He has been a problem for the past two years for while he is holding his own, he is not making the progress to be expected from an intelligence like his. He is a leader. His zeal and ingenuity in wrong doing are endless. As may be expected, he has no difficulty in distinguishing right from wrong. He always takes a leading part in class room discussions on ethical questions, and makes very fine rules regarding his own conduct, but doesn't live up to them.

This discrepancy between thought and action may be easily explained. Howard's parents died within a week of each other. leaving him a large fortune, of the existence of which he is acutely aware. His guardians are an old grandmother, who speaks no English, and the executor of the estate, who lives in another city four hundred miles away. The fact that he finds no difficulty in circumventing the grandmother, his sister, or any of the servants who surround him, explains how his misconduct is possible, but it does not explain why a boy who experiences no difficulty with work should be averse to doing it, especially as the individual system of instruction which holds in his school allows him to forge ahead as rapidly as he wishes.

Howard himself gives part of the answer: What's the use of getting in a higher class, I'm little and the fellows there wouldn't play with me. But this is not all. The device on Howard's shield is the dollar sign. He has never had the opportunity to learn that there are sources of enjoyment other than purchasable ones. The idea of rendering a service to the community through achievement has never occurred to him or been presented to him; he has never envisaged the satisfaction of self expression through an art or a science.

In spite of his mischievousness, Howard is looking for an objective. The "laissez faire" possible to wealth does not really appeal to him. He has obtained a freedom which is no real satisfaction to him. He does not, in the last analysis, enjoy pitting himself against the authorities. This mischievousness is merely the product of an agile and ingenious mind attempting to escape the confines set by unimaginative guardians and teachers. His behavior is not wicked; it is merely inconvenient, for much of it is an attempt to escape from a commonplace routine. When threatened with expulsion, Howard has no difficulty in conforming, showing that the absence of suitable motives and goals are largely responsible for his misbehavior. His fear of expulsion is however, only an inhibitor of action. To make this boy efficient, motives must be found which will stimulate his emotions and intelligence to acceptable ends. In the coming term, this boy will be drawn into some enterprise, probably some shop activity, with other boys, where he will have an opportunity to use his talents, and be obliged to co-operate with other boys on some project requiring information and skill. His academic work will be more carefully directed than hitherto, with a view to eliminating unnecessary repetition, and drill, as well as preventing idleness by apportioning the ground to be covered in a given time, with respect to the ease and rapidity with which he learns. In this way, it is hoped that Howard will not only cease to be a disciplinary problem, because of the ingeniousness with which he uses his spare time, but it is hoped that he will come to a realization of the possibilities in working for the sake of achieving.

Case 6. Raymond D. with an intelligence quotient of 135 has taken twice the usual length of time to cover a unit in spelling;—half again as long as the average for language, and two and a half times the normal period for arithmetic. His teacher reported (with what fidelity cannot be determined) that he could not be motivated.

Conduct was fair, and social reactions negative excepting the fact that he was generally an onlooker on the playground and didn't seem to know how to "get into the game." If nagged or scolded, the boy would sulk and hold resentment for an appreciable time, but was quite obedient otherwise.

The child was examined and told that he had done exceptionally well, that he could be the pacemaker for his class, and that he could progress by leaps and bounds. The child cleared off the back work within a week or two after hearing this, and since has been progressing at twice the speed of the average child. Two or three slumps have occurred, but only a little special interest and encouragement was needed to lift him out of these.

This case would have been dismissed as one due to the teacher's neglect and a lack of appreciation of his ability had not an unusually good opportunity made us acquainted with his environment.

The boy's father is dead. The mother has a little store which she manages with the help of Raymond's sister, who is several years older. The latter is an attractive girl, though not too gifted with intelligence, and a good helper in the store. Raymond is no more attractive than a growing boy of ten usually is. He is bookish, impractical, sensitive. His mother is a notorious nagger, who emphasizes Raymond's shortcomings, and is certain he will never amount to anything. There has been adequate ground, therefore, for the boy's developing a feeling of inferiority which seems to have paralyzed ambition. He has become sulky and resentful under unjust nagging, and of course does not distinguish between it and the efforts of the teacher to prod him into doing his work. Having brought about a more friendly attitude through judicious praise, the boy could be stimulated to greater efforts. At present the boy has a friendly attitude toward his teachers and is doing good work. He falls off occasionally when a new teacher who does not know the situation fails to provide the encouragement he needs. This boy's difficulties have been removed merely by providing the friendly interest and recognition children usually enjoy from the parents.

Case 6. The effect of environment is clearly shown in E. M., 15 years old, and in the eighth grade. She is an attractive girl of average intelligence. She is studying piano, singing and dancing, frequently appearing in public as a dancer. She has been doing this since she was eight years old. Her absences are frequent.

E's school work is below the performance of the average child in the Eighth Grade although she is over age. Her difficulties are ascribed to carelessness and indifference.

This child's intelligence is such that success in school work demands application. This she has never given for a number of reasons: her egotism has been satisfied by social success outside of the school. Her school work has been given an insignificant place in her life by her famliy. They have emphasized her social success and have ignored her failures in school. The interest and excitement incident to these social activities are far more intense than any the school has to offer. The family have tacitly acknowledged that this girl was never destined to receive more than an elementary education and have never stressed the importance of her school work. Conversation with the mother makes patent the fact this child's successes are the surrogate for those the mother has desired but missed, the daughter being merely the vehicle for the gratification of the mother's vanity.

As a rule, girls adapt themselves to school work more readily than do boys. The school seems more nearly to meet their needs; they are more suggestible and are more readily activated by ordinary incentives like praise, approbation and competition. If the girl has clearly defined intellectual interests, interest in school work is not thereby excluded. If she is doing work below her capacity, she seems to take satisfaction in doing it perfectly even though futilely. The non-motivated girl is likely to be a girl of average or less than average ability, and in many schools the average girl is likely to be of a well defined type—the youthful version of a shallow woman.

This girl represents a group of cases alike in the direction of their interests, their non-success in school work and inability to apply themselves to it. They are alike, too, in possessing certain stereotyped modes of reaction. In the tests, for example, far more pleasure is taken in responding in a rather superior manner with "I haven't the slightest conception," to a question they do not know than in answering it correctly. They are problems in discipline at home as well as at school. They differ in intelligence, ranging from average to superior,—the highest on the Stanford scale being 120. Everyone in this group of girls sings, plays on an instrument, or dances well enough to perform before a not too discriminating audience, but not one has an outstanding talent, nor have they the love of music, or the drama which generally accompanies a talent. It is very probable that their achievements, such as they are, are due to the absence of that restraint which generally hampers the ordinary individual when he performs publicly, and to incessant practice. On the whole, their success is cheaply bought, being obtained through the interest in and tolerance for extreme youth, and the pageantry of costume, setting and makeup.

When we realize that a child receives exactly the same mead of applause for hastily prepared, inartistic performance as does the individual who has worked and studied for recognition, we may well ask ourselves whether it is wise to accustom the child to cheaply bought victories, to jade the child's satisfaction in the work as an end in itself, or to build the child's life on a simple, perhaps evanescent talent.

It is not proposed to eliminate the arts mentioned above from the child's life. On the contrary they, especially dramatics,—are a part of the play tendencies, but it may perhaps be suggested that emphasis be placed on the activity as an end in itself rather than on the public performance, that when the latter does take place, it be with a certain finish, which need not be high, but certainly should represent persistent effort and the best of which the child is capable, and finally, stress should be laid on the performance as a means of giving pleasure rather than of displaying oneself.

The life of the child, like that of the adult, has increased in intensity and novelty, as education, despite many reforms in method and curriculum, has not increased. School appeals to the bookish, or to those to whom school work is easy, so that emotional and social needs are partially satisfied through the stimulus of ambition, competition and approval. To souls accustomed to the thrills of the moving pictures, the gratification of displaying a talent, and the ever-shifting panorama of events, the delights of the school are weak. The child who leads a quiet home life, with simple amusements, will come to the quiet interests of the school with unjaded palate, eager for the stimulus and knowledge which the school day brings. If he comes to the school with the belief that his work is eminently worth while, his success a matter of great concern to his parents, he will give himself to it with far more zeal than if he is doubtful of the value of his strivings and the things he is striving for.

TONSILS AND ADENOIDS: A STUDY SHOWING HOW THE REMOVAL OF ENLARGED OR DISEASED TONSILS AND ADENOIDS AFFECTS A CHILD'S WORK IN SCHOOL

By A. H. MacPhail

Part 1—In recent years much has been said and written about the physical defects from which children suffer, especially those defects that are remediable. Dr. L. Emmett Holt estimates that one-third of the school children in this country have remediable physical defects and this means from seven to eight million children.[1] Terman has estimated that ten per cent of our school children are suffering from the ill effects of tonsils and adenoids alone.[2]

The investigation presented here is concerned with the problem of tonsils and adenoids. It is not necessary to enumerate the many harmful effects that enlarged or diseased tonsils and adenoids have upon the child. The particular ill effect upon which this study focuses its attention is the quality of work done in school by children who are afflicted with abnormal tonsils and adenoids and it seeks to prove its point by comparing the quality of work that certain school children have done after having these tonsils and adenoids removed with the work that they were doing before the operation was performed. The physiological and psychological aspects of the problem are not touched upon but facts are presented to show that in the cases that have been investigated, it is true that children are capable of doing better school work after tonsils and adenoids, enlarged or diseased, have been removed.

The pupils whose school records, before and after having their tonsils and adenoids removed, were investigated were pupils in the Adams and Cranch Schools. The school nurse, Miss Marion Jackson, supplied the names of children who had been operated upon through her co-operation together with the date of the operation. Information was also obtained concerning others who had been operated upon independently of the school nurse.

In order to reach a fair estimate of the quality of work that these pupils had done before they were operated upon all those cases were discarded for which there was not available a school record of ten months before the date of the operation. Similarly all cases were discarded where no record was available for at least ten months after the operation. It was then found that both schools offered thirty-one cases that were considered worthy of investigation.

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[1] See "Democracy for Children," by Dr. L. E. Holt, Goodhousekeeping, May, 1919.

[2] See "The Hygiene of the School Child," by L. M. Terman, Houghton-Mifflin.

The first step was to look up the school record of each of these thirty-one cases for the ten school months immediately preceding the date of the operation. Following this, the school record of each case was looked up for each school month subsequent to the date of the operation up to the time when any given pupil left either of these schools for any reason, or up to the date of compiling this report in the case of pupils who were still attending school. As might be expected, it was possible to get a much longer school record after the operation for some pupils than for others.

In order to discover, if possible, just how soon after the operation the child began to do work of a higher grade than he had done before the operation, the history of each case was divided into periods of ten school months each. This term "period" will be often used in this discussion and will always mean a group of ten consecutive school months. It will be noticed that these periods are referred to as "the period before the operation," and the first, second, or third "period after the operation." Eighteen cases presented school records of at least twenty months after the operation, and a separate study was made of these. Similarly, eleven cases having a thirty month record after the operation offered an especially valuable study because of the opportunity to observe results over this longer period of time.

When the average that each of the thirty-one pupils attained in the first period after the operation was compared with his average for the period just before the operation, it was found that only about one-third (32.2%) of the cases showed an improvement and a little over a half of all the cases were doing a poorer quality of work! As is indicated a little later in this study, this poor showing in the first period after the operation is doubtless to be explained as an effect of the operation with consequent psychological impairment. By comparing an average of *all* work done subsequent to the operation with what was done before it became evident that improvement in school work is not often observed until after a year from the date of the operation.

When it had been conclusively shown that improvement was to be expected in the first period in only a few cases, it was naturally looked for in some later period. It became necessary then to make a very careful study of those cases that had longer school records after the operation. The eighteen cases that had records for twenty months (i. e., two periods) were investigated. Sixteen out of the eighteen records show that better work was done in the second period after the operation than in the first period after the operation. In other words about nine-tenths are able to do better work during the second year after the operation than during the year immediately following their operation. This fact corroborates what has already been suggested, namely, that in about two cases out of three, it takes the pupil about a year before the benefits of the tonsil and adenoid operation have produced such an improvement in the physical being of the child as to enable him to do better mental work. The results just mentioned show that nine-tenths of the pupils studied begin to reap physical and consequently mental benefits from their operation sometime *during the second year* after their operation.

TABLE A

Table Showing When Improvement Begins

	Per cent of Cases Showing Improvement		
	Period 1	Period 2	Period 3
Based on 31 cases	32.2	....	....
Based on 18 cases	33.3	66.6	....
Based on 11 cases	36.3	63.5	100
Based on all groups	33.9	65.	100

Table A presents an epitome of the information that was sought. It answers the questions that prompted this study. Recall at this point that " improvement " implies increase over pre-operation averages. Basing its conclusions on all the group studies that have been made, we find that 33.9% of all the cases do better work during the first year after the operation; 65 % do better work by the end of the second year; 100% do better work by the end of the third year (this last conclusion based on eleven cases). These conclusions are not based upon theory or estimates, but are derived from actual cases as a perusal of the tables and diagrams presented in this study show. It is hoped that having their foundation in fact, they may be of some value.

Part 2—The conclusions drawn in Part I of this study may very well be questioned on the ground that the comparisons made are kept entirely within the group. In other words, the study concerns itself only with children who have had their tonsils and adenoids removed. If a similar study were undertaken having as its subjects school children taken at random except with the exclusion of those children dealt with in Part 1, and similar results were found to be true in this second group, then the conclusions of Part 1 would be without significance. If a large number of children at random improve from year to year in the same manner that children who have had their tonsils and adenoids removed improve, then the actual removal of the diseased tonsils and adenoids drops out of the situation as a controlling factor. Hence, to test the validity of the conclusions stated in Part 1, this second investigation, which may be called a check experiment, was made.

To get data for this check experiment a total of one hundred children was selected from the Adams School and the Cranch School. Since it was necessary to secure their records for each of four consecutive school years, it is obvious that these children had to be taken from the fifth, sixth, seventh, and eighth grades. As in Part 1, in order to discover how many improved in the quality of their work and when, the rating of each case for the first year was considered as zero, in the sense that with it each of the second, third, and fourth years was compared. For example: Case 21 was doing the same kind of work in the second, third, and fourth years as was done in the first. Case 32 did better work in the second, third, and fourth years than was done in the first. Similar comparisons were made for each of the one hundred cases taken at random. The results of this investigation showed that in the second year 42% of these children at random did better work than in the previous year, namely, the first year. In the third year 41% were doing better work than they did in the first year, and in the fourth year 41%. Note that the per cent of cases that showed improvement is practically the *same* for each year, 42%, 41%, 41%.

At this point it will be necessary to adopt certain terminology that was used in the previous study. The term 'period' means a school year of ten months. Using the first year records of these one hundred children as the norm with which the three subsequent years are each to be compared, the second year will be referred to as the first period, the third year as the second period, and the fourth year as the third period. It is now possible to compare the manner in which pupils who have been operated upon for tonsils and adenoids have improved in their school work with the manner in which children at random improve. Refer to Table B for this comparison.

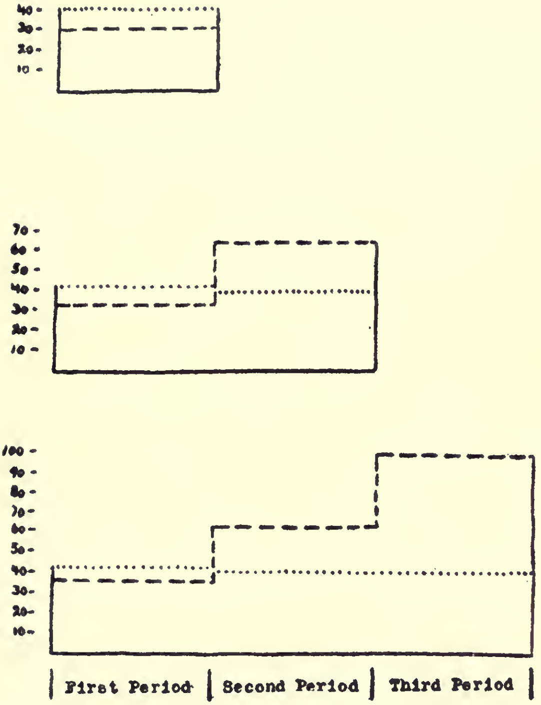
TABLE B

TABLES SHOWING HOW TIME OF IMPROVEMENT OF "OPERATED CASES" COMPARES WITH IMPROVEMENT AMONG CHILDREN AT RANDOM

		1st Period	2nd Period	3rd Period
A	Per cent of 31 cases (operated upon)	32.2	....	....
	Per cent of 100 children at random..	42.	....	....
B	Per cent of 18 cases for 30 months (operated upon)	33.3	66.6	....
	Per cent of 100 children at random..	42.	41.	....
C	Per cent of 11 cases for 40 months (operated upon)	36.3	63.5	100
	Per cent of 100 children at random..	42.	41.	41.

The conclusion reached in Part 1 that pupils who are suffering from the ill effects of diseased tonsils and adenoids are made capable of doing better school work by being operated upon seems to be quite justified by the results of this check experiment. Part A of Table B agrees with what was stated in the previous study, that immediately after the operation, there seems to be a dropping off in the quality of school work done, and it is here seen that 42% of pupils at random improve in this period where only 32% of the thirty-one operated cases show any improvement. The validity of the conclusion reached in regard to ability to improve rests then upon Parts B and C. Disregarding a very slight variation of 1%, it has been shown that the percentage of children at random who improve from year to year remains practically static, while among the pupils who have been operated upon for tonsils and adenoids there has been shown to be a pronounced increase from year to year in the percentage of pupils who improve in the quality of their work. Generally speaking one-third of the operated cases improve in the first period, two-thirds in the second period, and three-thirds in the third period. Over against this we have the fact that of the children at random two-fifths improve in each of these three periods. This same data is presented graphically in Table C where the *horizontal* dotted line representing the per cent of pupils at random who improve from period to period is in striking contrast to the mounting steps which indicate the increasing number from period to period who improve among the operated cases. Among school children at random the number who are doing better work than at some given previous time *remains practically the same* from year to year. Among children who have had their tonsils and adenoids removed the number who are doing better work than before

TABLE C



the operation *increases rapidly* from year to year, and when two years have passed *exceeds* the number of children at random who improve.

SUMMARY

This study was undertaken to discover how the removal of enlarged or diseased tonsils and adenoids affects a pupil's work in school. The school records of thirty-one pupils were investigated, both before and after the date of the operation, and such comparisons were made as would show whether a pupil's work improved and when that improvement became evident.

The results of the study may be expressed as follows: of fifteen school children taken at random from among their associates, six may be expected to be doing better work one year from now, six may be expected to be doing better work two years from now, and six three years from now! But of fifteen children who have just been relieved of diseased tonsils and adenoids, five may be expected to be doing better work one year from now, ten at the end of two years, and all (or very nearly all) when three years have passed. Here seems good reason to believe that the removal of diseased tonsils and adenoids is a factor in beneficially influencing the mental life of the school child. Not only is the health impaired by failure to remove these diseased parts but the mental life and activity of the child as well.

PUPILS' JUDGMENTS OF THEIR TEACHERS

By Edward William Dolch, Jr.

The opinions that pupils have of their teachers are certainly of value if those opinions are honestly and frankly given. Pupils are, on the whole, fairminded, and they are assuredly not deceived as to the character and effectiveness of those over them. Single individuals are frequently biased, of course, but such bias is not a disturbing factor when a sufficiently large number of judgments are secured. Though every teacher is aware that certain of his pupils are antagonistic and certain ones are overdisposed to be friendly, he is also aware that the whole body of his students, taken together, has a very fair idea of his worth, both as a man and as a teacher.

To get such opinions, the English teacher has an unparalleled opportunity. Through the assignment of theme subjects, he is able to explore at will his pupils' experience and thought. Constantly reviewing, as he is, the content of their minds, why should he not turn this review to account? Think of the mass of material that could be accumulated by a number of teachers over a period of years. Of course the information would have to be secured with some care and with as much scientific method as possible. But if the work were done in the right way, the results would certainly be of value.

The report which follows is a suggestion of what might be done in this line of investigation. It is not a model, as will be noted later, but it is an indication of what might be done on a large scale and with more fully controlled conditions.

Three classes of university freshmen were asked to write a short theme on the subject, "My Best High School Teacher." They were told to use the word "best" just as they would ordinarily use it, and to give their reasons for thinking the teacher best as fully as they could within the limits of about two hundred words. As they had been writing on similar subjects for about two months, expressing their personal views on questions of school life and matters of general concern to students, they took this theme quite as a matter of course and to all appearance felt no hindrance to frank self-expression. Their teacher had at all times put them as much as possible at their ease in discussing personal matters and had encouraged sincerity and directness.

As there were very few girls in the three classes, their papers were not considered. There were left, therefore, 82 reports, all from men. Some had given second and third choices, but, for the sake of consistency, only the first choices were taken into consideration in Table I. Here are shown two points, distribution of choices by sex of teachers mentioned and by subjects taught.

TABLE I

High School Teachers "Liked Best" by 82 Boys as Stated in University Freshmen English Themes

82 Total	44 Men	38 Women	Subject Taught
21	11	10	Mathematics
16	10	6	Subject not given
15	3	12	English
8	4	4	History
6	6	0	Physics
3	2	1	Chemistry
3	1	2	Science
2	2	0	Civics
2	1	1	Commercial
2	1	1	Modern Language
1	1	..	Manual Training
1	1	..	Agriculture
1	1	0	Biology
1	0	1	Latin

In the first place, the importance of the choices here expressed needs perhaps to be emphasized. Each of the 82 men had had in high school, on the average, at least 10 teachers, so that each had picked out the one he felt to be the "best" teacher of at least 10. Consequently, the 82 teachers mentioned represent, no doubt, a total number of over 800. The thinking which was back of these reports must, therefore, have consisted of a mental review of the work of all of these 800 teachers, or at least of those who were still prominent in their memory. Indeed, the tone and temper of the writing showed a very thoughtful consideration of the matter by practically all of the students.

In Table I, two points at least are of interest. The first is that just about half of the chosen teachers are men and half are women. Other things being equal, we should expect a boy to prefer a man as a teacher. Either that supposition is false, or other things were not equal. That is to say, a greater total proportion of women teachers would have increased the chances of there being strong individuals among them. Or it might be possible that the women were, on the whole, more adapted to the work and therefore more likely to favorably impress their pupils. The material at hand does not enable us to answer any of these questions.

The second point in Table I is the distribution by subjects taught. Here the clear predominance of Mathematics and English would seem to need an explanation. The one that would first occur is that these are required subjects, or ones required for several years, and that therefore the chances were in their favor. This might be the answer, except for the argument that the other subjects, being electives in most part, should certainly have proven more attractive, if we assume that pupils elect subjects because they have strong interest in them. A sceptical person might discount the English choices since they were reported in English themes, but no such circumstance would account for Mathematics having first place. Nor was the chosen profession of the student a factor here, the engineering freshmen favoring the mathematics teacher no more than the freshmen in agriculture or arts and sciences. If we can find no other explanation, we are forced to assume that because Mathematics and English were subjects required of all, their predominance is due to the greater number of chances in their favor. In that case, the table seems to yield the conclusion that subject taught was not a factor at all, but that the choices were pretty evenly distributed over the whole of the curriculum. That is to say, a forceful and effective teacher will make a lasting impression on a student, no matter what subject he is teaching.

Table II presents another phase of the report, the qualities for which the teacher was singled out as "best." Here we were able to count those teachers who were described as second and third choices, for certainly they also had the qualities that impress students, though perhaps not in the same degree as the teachers mentioned first. This gives us 120 teachers in all, described by these 82 men as having been the "best," or among the "best," they had known in high school. Some difficulty arose, of course, in tabulating the qualities mentioned, but their descriptions were as far as possible preserved in the students' own words. In no case was one student's testimony twisted to fit another's statement. Keeping the students' phraseology gives the list a rather naïve tone, but this very fact furnishes an added interest.

From Table II, one thing is clear. The students took "best" to mean having ability to teach. The phrase used most often, and one from the students' own colloquial speech, was that he or she "knew how to teach." The qualities next in rank are also phases of teaching ability. Personal qualities follow

TABLE II

QUALITIES MENTIONED AS REASONS FOR A TEACHER'S BEING "LIKED BEST"

One Hundred and Twenty Teachers Described by Eighty-two University Freshmen, Some Writing of One, Others of Two, And a Few of Three Persons

Material—English Themes

Times Mentioned	Quality as Described in Themes
69	Knew how to teach
50	Was interested in students
40	Had good discipline
39	Knew the subject
38	Made the work interesting
31	Was good natured
23	Had broad education and interests
20	Was interested in student activities
15	Was fair
11	Was socially popular
10	Had attractive personality
9	Was stern
9	Was practical
9	Had good character
6	Had sense of humor
6	Compelled attention by methods
4	Trusted students

with less numbers, some of those most often thought of by some of us being far down the list.

There is an interesting possibility for an explanation of this predominance of teaching ability. Might it not be that, after a two months' struggle with college work, the students were thinking with gratitude of those high school teachers who had grounded them well in prerequisites and with less regard then formerly of those who had not? There is certainly reason to think that just such a change in point of view would come about with the change from the high school hall to the university campus, yet in the boy who did not go to college, would not increasing maturity bring about much the same change? There might be some comfort in this thought for the high school teachers who feel that adolescence does not sufficiently appreciate good teaching.

The value of any such canvass as this depends, as we have stated, upon the frankness of the opinions expressed. Here it was felt that the students had no motive for a repression of honest opinion and none for the statement of a dishonest one. It is not claimed that these opinions are the same that were held while the boys were still in high school; probably the change to the university had altered their views. But with which is the high school teacher most concerned, what his pupils think of him while he is teaching them, or what they will think of him in more mature retrospect? Very possibly, not enough statements are represented to show the same result that an investigation of a thousand cases would. Very possibly an investigation of the opinions of women university students would show markedly different results. These are matters for further study and ones that could be easily settled by even a slight co-operation on the part of the English Department of any college or university having a large enrollment. Very possibly, the opinions of high school graduates who go to college would not be entirely the same as those of graduates who do not, or even of those who never graduate. Yet the views of university freshmen should furnish a good indication of those of the whole high school student body.

It remains only to repeat that this study is but a slight attempt in a field that should prove constantly and widely valuable—the investigation of the experience and thought of pupils through their self-expression in English themes.

QUESTIONNAIRE FOR THE OBSERVATION OF A YOUNG CHILD FROM BIRTH TO TWO YEARS OF AGE[1]

Translated by Martin L. Reymert, Iowa State University

The following questionnaire forms a part of a more extensive article by Dr. Simon on the first two years of life in the reference given (in all 64 pp.). The questionnaire is intended for parents, and the different questions are analyzed and explained quite extensively in the accompanying text. As infant psychology is now in vogue in this country, the attempt of Dr. Simon may be of interest. He seems to be aiming at a real rating scale for early infancy.

Name and surname of the child....................................
Date of birth..
Full time birth?...
Sex ....
Weight at birth..
Weight at date of examination....................................
Condition of teeth at the same date.............................
Duration of sleep (in hours) at night...........................
Number of awakenings..................from..........to.........
During daytime ....
Previous sicknesses ....
Vocation of the parents..
Has the child brothers or sisters..................................
With whom does it live...
Age and sex of these..
Date of examination..
The examiner's name and address...............................
Is the examiner familiar with the child, or not.......................
(Degree of relationship; personal acquaintance, friend or stranger)
....

I. Sight

Does the child's look indicate a vague contemplation? (First Day.)
Does it fix its eyes habitually on the ceiling? (First Days.)
Is it possible to bring about a convergence of the eyes upon an object? (Seventh Day.)
Do the child's eyes follow:
  (a) A white paper or a lighted match moved slowly before it from one side to another. (Thirtieth Day.)
  (b) An object that moves back and forth. (Third Month.)
  (c) The deplacement of a person to another place? (Third Month.)
  (d) A ball, that is thrown?
  (e) The flight of a bird.

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[1] By Th. Simon (*Bulletin de la Société Libre Pour L'Etude Psychologique de L'Enfant. Numero* 108. 16 *Annee* (n°2), 1916).

(f) Are the eyes constantly exploring? (Third Month.)
(g) Does it detect a thread? A hair? (Eighth Month.)

AUDITION

Is the child aware of:
The human voice?
A sound? } (Fifteenth Day.)
Does it turn its head toward a sound, dog or bell? (Third Month.)
Does it search for the one calling it? (Third Month.)

II. RECOGNITION

Does the child respond in a special way:
(a) to the face of the mother? (Third Month.)
(b) to a familiar voice?
(c) Does it manifest joy over the preparations for taking it out? (Fifth Month.)
(d) Does it manifest astonishment:
(a) by seeing itself in a mirror?
(b) before a picture of its parents? (Seventh Month.)
Is its attention fixed?
Does it get curious (eyes and mouth wide open) by a stranger? (Seventh Month.)
Does it turn with curiosity when it hears a door being opened? (Eighth Month.)
Does it examine (with lips pressed together) the object just being grasped? (Ninth and Tenth Month.)
Do the eyes follow an object, which the child drops? (Ninth to Tenth Month.)
Does it observe *acts in series* (the preparation of its meal for instance)? (Twelfth Month.)
Can it pick out among general photographs the photo of a certain relative? (Twelfth Month.)
Does it put out its hands?
Does it try to put pictures, it has seen, together, to make a book? (Twelfth to Eighteenth Month.)
Does it no longer try to take the faces or the figures (which it sees) from a book?

III. AFFECTIVE MANIFESTATIONS

Does the child make grimaces, when its face is touched by a little cold water? (First Days.)
Does it open its eyes with pleasure and spread its fingers apart upon being given a warm bath?
Does it show its joy by timely movements?

Sympathy

Does the child smile back?
Does it laugh audibly? (Eighth Month.)
Does it laugh, when one is laughing near by? (Tenth to Twelfth Month.)

Desire

Does it merely open its eyes and advance its lips? (Seventh Day.)
Does it express its desire by outstretched arms? (Fifth Month.)

Fright

If one approaches one's hand to the child's eyes, in a threatening way, does it raise its arm? (Third Month.)
Does it recognize a grouchy expression in a face? (Does it draw the corner of its mouth or does it start to cry)? (Sixth Month.)

Do its arms tremble at a sudden noise? (Thirtieth Day.)

Does it nearly wink its eyes at a sudden noise? (Eighth Month.)

Does the contact of a feather or a hair make it withdraw its hand? (Eighth Month.)

Is the child afraid of animals that it has never seen before? (Twelfth to Eighteenth Month.)

Is the child afraid of
Black clothing?
Of hands with gloves on?
Of changes in dress?
(Twelfth to Eighteenth Month.)

IV. Motor Activities

If one touches the lips of the child with the finger, does one get sucking as a response? (First Days.)

Will blowing lightly on the one or the other of the child's eyes call forth the closing of the eye? (First Days.)

If one touches the tip of the nose of the child will the eyes close themselves? (First Days.)

If one touches one of the nostrils, what is the response of the eye at the same side? (First Days.)

Will a light tickling on the sole of the foot provoke the spreading and extension of the toes? (First Days.)

Will a stronger rubbing of the sole, make the child withdraw the whole foot? (First Days.)

Are the movements co-ordinated? (First and following days.)

Do the fingers show slow and indefinite contractions? (First Days.)

Does the child show slow and partial puckering the lips? (First Days.)

Grasp

If one puts a finger in the palm of the child's hand, does it close the hand? (First Days.)

Does the child try to grasp objects presented to it, and if failing, does it seem to renew its efforts? (Fifth Month.)

Does the child try to grasp at the same time, both the object and the base on which it rests? (Seventh to Eighth Month.)

Does the child get hold of the object thrown to it, right away on the first trial? (Ninth and Tenth Month.)

Does it grasp small objects between the thumb and the index finger? (Twelfth Month.)

Can it get a foreign object (a piece of bread, for instance) out of its mouth again (by hand)?

Carriage of the Head

Does the child's head have just a chance balance?

If one puts it erect, for how long a time can the child keep its head erect? (Fourth Month.)

Sitting Position

Does the child raise its head from the pillow? (Third Month.)

Does it succeed in lifting its body in the cradle? (Sixth Month.)

Can the child *sit* with the help of a pillow? (Eighth Month.)

Can it sit without any assistance? (Eleventh Month.)

Walking

Held under the arms, with the feet touching the floor, does it make alternating movements of the feet, crossing one over the other, and placing one foot upon the other?

Or does it place its feet properly while still making exaggerated flexion? (Ninth-Tenth Month.)

Does the child creep around the floor? (Ninth-Tenth Month.)
Can it stand erect for an instant without support? (Eleventh Month.)
Can it raise up, by the help of the nearest support? (Twelfth-Eighteenth Month.)
Does it take several steps if one holds it by the hand?
Can it raise up without support? (Twelfth-Eighteenth Month.)
Does it walk alone?
  (a) too quickly with its head leaning forward? (Eighteen Months-Two Years.)
  (b) rather slowly, but able to reach the goal? (Ten Months-Two Years.)
Does it climb a step, without aid?

Activities. (Properly so-called).

Does the child imitate the farewell gesture with its entire arm?
Does the child carry things to its mouth without fumbling? (Ninth-Tenth Month.)
Does it amuse itself by banging objects against one another or upon the table or its chair? (Ninth-Tenth Month.)
Does it still drop its toys? (End of First Year.)
Does it occupy itself: (End of First Year.)
  By splashing water?
  By filling and emptying small boxes?
  By putting on a paper hat?
  By hiding its ball in play?
Can it put its tongue out at a person? (End of First Year.)
Does it return a hand shake? (Twelfth Month.)
Does the child imitate: (Twelfth-Eighteenth Month.)
  Sewing?
  Writing?
  Crossing the arms?
  Coughing?
  Sucking?
  Reading?
  Feeding dolls and animals?
  Sweeping?
  Brushing?
Does it aid in setting the table? (Twelfth to Eighteenth Month.)
Does it aid in the housekeeping? (Twelfth to Eighteenth Month.)
Can it:
  Blow out a candle?
  Put a cork in a bottle?
  Open and close a door?
  Blow on a trumpet?
  Draw a string up to him by using both hands alternately?
  Put a coin into the opening of a "savings bank?"
  Unscrew a cover?
  Salute (Bowing)?
Does the child try to dress itself alone?
Does the child try to eat alone with a spoon and how does he manage it? (Eighteen Months to Two Years.)

V. LANGUAGE

Babbling
Crowing
Vowels
Consonants
Syllables

I. *Monologues*

"rara-o-go-aggege" (Fifth Month.)
"brrr-ha" (Sixth Month.)
} recognized? When?

II. *Comprehension*

Does the child respond, when its name is called? (Twelfth Month.)
Where is: (Twelfth-Eighteenth Month.)
  The head?
  The lamp?
  The door?
  Papa?
  Your hat?
Where are papa's eyes? (Eighteen Months to Two Years.)
Where is little sister's (or mama's) hair?
Where is your nose? Where is mine?
Where is your ear? Where is the other?
Cross your arms?
Pick up this or that object.
Fold your napkin.
Give me your drinking glass.
Take the handkerchief which is on the table and put it on the chair.

III. *Repetition*

Say after me: (Eighteen Months to Two Years.)
  ma
  pa
  dada
  lolo
  painpain
  du lait
  Un auf
  soulier
  gateau
  citeau
  cheval
  mouville
  pantalon
  chocolat

IV. *Language in a narrower sense*

Does the child express its desires by infinitives or substantives? (Eighteen Months to Two Years.)
Does it express its judgment by a single word? (Warm for instance.)
Does it designate animals by the imitation of their cry or by their names?
What is your name? (Eighteen Months to Two Years.))
What is this? (Object shown to is a chair for example.)
What is the use of this?
What does ....?
Do you want..................?
(State if response is yes or no.)

BOOK REVIEW

Quelques Traits de la Vie de Jesus au Point de Vue Psychologique et Psychanalytique. By GEORGES BERGUER. Paris, Atar, 1920.

With the single exception of G. Stanley Hall's two volumes on "Jesus the Christ in the Light of Psychology" Berguer's book on Jesus is the most extensive and important piece of literature in its field. As such, the space devoted to reviewing it may best be utilized in presenting an abstract of the most significant points, without turning aside for critical comment.

In an elaborate introduction, Berguer makes an interesting comparison of the early development of Christianity and of the old mystery cults. Both religions rose in a time of national decadence. The mystery cults had their inception when the power of Greece and Rome was on the wane, and Jewish peoples had passed the zenith of their glory before the Christian religion was formulated. Therefore both Christianity and the ancient mysteries were the product of introverted mental processes. The great men of the time, seeking in vain for a satisfaction of their pride in their nation in external circumstances, were forced to seek solace in the depths of their own thoughts and feelings. This involved an introversion of the libido, which reëmerged to find expression in a new ideal of life, a symbol of their racial aspirations, a wish-fulfillment phantasy to take the place of that which was denied them by reality.

Just as the environmental and psychic background of the Christian faith and the mystery cults was similar, so they passed through like stages in their growth. This is best represented in the successive symbolizations of union with the deity. At the beginning, union with God was conceived as material. Thus, the ancients ate the sacred animal, and the followers of Christ could only receive the Holy Ghost when they felt a "whisper on the wind," as if the very breast of the dead Saviour must penetrate their flesh. Sexual union was a common symbol of divine union in the mystery cults, when these became a kind of nature worship. Traces of this confounding of human love and divine love are found in the Bible, which represents union with God as marriage, and worship of false gods as adultery. The third stage of symbolisms harks back to the "family romance" and visualizes God as the all-father, the creator. This, too, is characteristic of Christianity and the mystery cults, and out of it grows the idea of rebirth, of spiritual regeneration. The idea of the climbing of the soul is universal.

If we apply the psychoanalytic conception of the family romance to the story which throws the glamour of the Virgin birth upon Jesus' life, we shall find that the Christmas legend conforms to the typical myth motives. In the first place, Jesus is elevated from the humble position of the carpenter's son to that of divine parentage, which is always one of the mythical characteristics. In the second place, the universal motive is the announcement of some misfortune which necessitates the abandonment of the child by its illustrious parents. In the Christmas story, this is replaced by the massacre of the innocents ordered by Herod. In the typical myth, the lost child finds his true parents and is restored to his rightful position. In the case of Jesus, he found his divine father with the conviction of his Messianity. This is the interpretation of the Jesus legend interpreted by Freudian principles.

If we apply the method of interpretation worked out by Jung and Silberer, we get a somewhat different conception. Let us consider the conflicting emotions aroused in the folk-soul by the life and death of Jesus. Here was a man who went to a most tragic and ignominious end, but whose personality was the embodiment of the god the people worshipped. Because they had sinned against him, they raised him to the highest possible eminence in atonement. The story of the divine conception was more than a historical fact, it was a psychological verity, the expression of deep emotions. "This man could not have been as other men," said the dream of the folk-soul. "His parents could not have been his real parents. He is not born of man but of God, although he is the son of woman."

The baptism scene is as susceptible to psychoanalysis as the story of Jesus' birth. According to the Freudian method, the dove and the open heavens would be sexual symbols, and the feeling of union with God would be purely a sex sublimation. But although the roots of the symbolism may have been sexual, it had also a teleological, an anagogic aspect. It was indicative of the future life of Jesus and of his spiritual union with the Father. It is the giving of himself up to those inner inclinations of his own soul which he interpreted as the voice of God saying "You are my well beloved son." Herein Jesus freed himself from the thwarting influence of the family complex. His hostility to the father was replaced by confidence in his love. Freed from this, which is one of the chief internal obstacles to a full and free life, Jesus felt himself animated with a dynamic energy of surpassing force. What more natural than that he should interpret this by the voice choosing him from all men, assuring him that he was the long-expected Messiah?

The temptations symbolize the personal temptations of Jesus. To turn the stone into bread would have been to use his Messianity for material advantages. To yield to the suggestion to throw himself from the roof of the temple and let the angels support him was the temptation to become fanatical, to cease to live in touch with reality, to ask God to intervene in the course of natural laws. And the third temptation was the temptation to false and diabolical mysticism, to use the power of his position to become the political master as well as the spiritual guide. To this, too, Jesus replied "Get thee behind me, Satan."

The teaching of Jesus is affirmative because he seeks to have others duplicate the psychic experience through which he has passed, to trust their inner inclinations, to feel themselves an integrated personality, ready for adequate action. By a sort of intuition, he taught this precept to the people in the only language they could have understood,—in the symbolic speech of the parable. The kingdom of heaven of which he spoke was the reign of God in the hearts of men here on earth. It would be first a psychic and later a social state. The kingdom and the Messianity are the symbolic expression of the two great psychic experiences in the life of Jesus.

The miracles of Jesus are no more marvellous than the cures of modern psychotherapy. Jesus cured by suggestion. The sick people had the same doubt alternating with confidence in Jesus that the modern neurotic manifests in the analyst at the time of transference. It was the personality of Jesus that wrought miracles in the minds of his fellowmen.

The critical experience of Jesus' life can be summarized in one word, —*Father*. In receiving into his life the full influx of the elan-vital, the libido, the moral imperative, or whatever you may choose to call it, Jesus felt himself like the father. Humanity has always to make this transition. The child has always an ambivalent feeling to the father, an emotion of love and hate mingled. To achieve an adult personality, the individual must free himself from the hate of the father, must realize that he is not a thwarting force, but is a being to be only loved and trusted. Jesus accomplished this by raising his father into a being to be worshipped, and in feeling a mystic union with him. He even sacrificed his own life willingly to prove that he was indeed the Son of God, obedient to divine command. His was the sublime sacrifice for adulthood. Yet in thus giving his life he won it as never before, for he felt the deepest satisfaction and freedom of the soul. The supreme pathos was the fact that he died without knowing the incomparable grandeur of his death. He only knew that he was led to this fate by an all-wise and all-loving father. He did not know that his example was necessary for mankind, in order that all humanity might see the necessity for the sacrifice of the hatred of the father, in order to achieve their full possibilities. In his death and resurrection, the inner psychic life of the whole human race was expressed. The Christ legend, birth, death and resurrection, is the exposition of the family romance and of the sacrifice which is rebirth.

Such a meager outline can do no more than to suggest some of the main themes in Berguer's book. The treatment is consistently psychological, and will repay a careful reading.

PHYLLIS BLANCHARD.

BOOK NOTES

French Literature in the Great War. By Albert Schinz. N. Y., D. Appleton and Co., 1920. 433 p.

The author, who is a professor of French Literature at Smith College, is well qualified—and it is a very high compliment to say so—to deal adequately with his great theme. Just before the outbreak of the war French literature underwent something like a Renaissance, and there was a strong new spirit of devotion and return to medieval and Catholic ideals. This was the background, and it was from this as an inspiration that much of the best literature that appeared during the war and many of the heroic acts had their source. Professor Schinz's book, then, merits attention not merely by students of the French language and literature but by all students of religious or moral phenomena, especially those on a large scale involving not merely individuals but races and nations.

Graphology and the Psychology of Handwriting. By June E. Downey. Balt., Warwick and York, 1919. 142 p.

These studies seek to canvass the possibility of a scientific characterological utilization of handwriting. Their main purpose is one of orientation, preliminary to an attempt to use graphic activity in tests of temperament or character traits, tests which are now in process of standardization. Part I gives a critical comparison of graphological contentions and the outcome of modern scientific investigations of handwriting, while Part II reports a number of experimental studies designed to try out methods of research. Free use is made of the results of other investigations.

Imagination and Its Place in Education. By Edwin A. Kirkpatrick. Bost., Ginn & Co., 1920. 214 p.

Science embodies universal truths; literature expresses truth as seen or exemplified by individuals. Neither alone can adequately deal with imagination. Psychology seeks to present what is true of all minds, but in no field are individual variations so great. In Part I the author treats imagination and related activities; in Part II, the imaginative life of children; III, school subjects and the imagination.

Personal Beauty and Racial Betterment. By Knight Dunlap. St. Louis, C. V. Mosby Co., 1920. 95 p.

The author makes the procreation of children the predominant ideal in marriage, minimizing companionship and other "spiritual" factors. Another feature of this book is that although he calls attention to various manifestations of sex he has no practical reform program to propose. In the first part he discusses the significance of beauty with negative and positive traits, while the second part is devoted to a discussion of its conservation.

The Nursery School. By Margaret McMillan. N. Y., E. P. Dutton & Co., 1919. 356 p.

This book is written in response to a desire expressed by many for help in the starting of nursery-schools. Hundreds of thousands of children are in dire need of education or nurture during the first years, and the nursery school, according to the author, has emerged from the experimental stage. Here we have an excellent survey of the whole subject in two parts: I, with chapters on plan of the buildings, garden, reading, writing, dinner hour, etc., for different ages up to seven, while in Part II the training of the teacher is described, dental and clinic training, physical training, hand-work and art teaching, holidays, and many other topics. There are a number of interesting illustrations showing in more detail the possibilities and novelties in this field.

Introductory Psychology for Teachers. By E. K. STRONG, JR. Balt., Warwick and York, 1920. 233 p.

The first part of this book discusses the learning process; the second, individual differences. The last part takes up some physiological aspects of psychology.

The Supervision of Instruction. By HUBERT WILBUR NUTT. Bost., Houghton, Mifflin Co., 1920. 277 p.

This book is a discussion and analysis of the elements of the supervisory process and a statement of the technique and professional standards for this work. The author discusses such topics as: The Job of Supervision, Principles Underlying the Supervision of Instruction, Devices of Supervision, Technique, etc.

The Child Under Eight. By E. R. MURRAY and H. B. SMITH. N. Y., Longmans, Green and Co., 1919. 236 p.

The two authors have worked harmoniously though they have not collaborated. Part I, "The Child in the Nursery and Kindergarten," has twelve chapters, with such titles as Joy in Making, Stories, From Fancy to Fact; while Part II, "The Child in the State School," deals with "Things as They Are," Practical Application of Vital Principles, and Consideration of the Aspects of Experience, including the experiences of human conduct, the natural world, mathematical truths, of the life of man, etc. It is a little hard to classify this book to know just where it would fit, what special good it is aimed to accomplish, or even how much real knowledge of childhood these authors, evidently both teachers, have.

Moral and Religious Education. By SOPHIE BRYANT. N. Y., Longmans, Green and Co., 1920. 256 p.

This book is written on the assumption that, in order to secure the best result over the widest area, teaching morality through the development of religious faith, with its direct appeal, is the best way. Young people are especially susceptible to the emotional appeal to religious feeling. Thus, starting with the exposition of the notions of self-liberation by self-realization, the author discusses the moral and religious ideals, while the last part deals with the reasoned presentment of religious truths.

Manual of Directions. By M. E. HAGGERTY. Yonkers, World Book Co., 1920. 59 p.

This is a pamphlet giving directions how to achieve examinations in reading: Sigma 1, and Intelligence examinations: Delta 1 and Delta 2, with accompanying charts.

The Field of Philosophy. By JOSEPH A. LEIGHTON. Columbus, R. G. Adams and Co., 1919. 485 p.

This is a second revised and enlarged edition. The author tells us that he has long experimented and pondered as to the best method of giving an introductory course and, after much experience, has found one which seems to him satisfactory and which is presented in this book. Part I treats of the chief problems and standpoints of Greek and medieval philosophy and II, those of modern philosophy.

The Teacher's Ideals of Life and Happiness. By WILLIAM HENRY PYLE. Columbia, The Missouri Book Co., 1920. 109 p.

In this book the author aims to help his fellow-teachers to think deeply about the serious concerns of human life. He has been a teacher for twenty-five years and thinks what the teacher most needs is not more theory or method but a wider outlook and deeper convictions concerning the fundamental things of life. So he discusses, in successive chapters, the ideals of literature, work, play, democracy, home and children, art and beauty, and morals and religion.

Spiritual Pluralism. By C. A. RICHARDSON. Cambridge, Univ. Press, 1919. 335 p.

This work is dedicated to James Ward. The author says in his Preface that his main purpose is to present and defend the theory that the texture of the universe is through-and-through spiritual. The form of such a theme, of course, is modified greatly by the teaching of schools of thought that oppose any kind of idealistic interpretation, e. g., the Neo-Realists, whose results in the main, although this author is not entirely in sympathy with them, he admits not wholly incompatible with his own views.

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INTELLIGENCE OF TROOPS INFECTED WITH HOOKWORM VS. THOSE NOT INFECTED

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HISTORY AND PROCEDURE

During the War, Major B. F. Pittenger, Sanitary Corps, chief psychological examiner at Camp Sevier, in collaboration with Major Charles A. Kofoid, Sanitary Corps, in charge of the Laboratory Car Metchnikoff, made a study of the comparative intelligence ratings of the recruits found to have hookworm infection and those without infection, of the 9,254 men of the April, 1918, draft increment. A report thereon to the Office of the Surgeon General, Division of Psychology, was made by Major Pittenger in comparative tables for hookworm and non-hookworm groups, respectively, in terms of Alpha and Beta scores, for white and for colored troops. Of these data Major Charles A. Kofoid and Lieutenant J. P. Tucker, Medical Corps, offer some interpretation in their report to the Laboratory Division of the Surgeon General's Office "on the relationship of infection by hookworm to the incidence of morbidity in 22,842 men in the United States Army at Camp Bowie, Texas, from October, 1917, to April, 1918."

The manifest inferiority of the median intelligence scores of the 762 hookworm cases to the 8,492 non-hookworm cases suggested the desirability of a more comprehensive study wherein each hookworm case could be paired with a non-hookworm case from the same local community. Accordingly Major Kofoid recommended to the Surgeon General a co-operative study of the problem by the Laboratory Division and the Section of Psychology. A psychological officer was not immediately available, but Major John L. Riley, Sanitary Corps, was released by the Section of Physical Reconstruction for temporary duty with Major Kofoid in organizing and promoting the early work of this investigation. Under their direction a group of officers, laboratory technicians and enlisted men proceeded to assemble and to code for Hollerith treatment the intelligence ratings of recruits infected with hookworm and of their non-infected pairs.

During the second week in July, 1919, Captain Garry C. Myers of the psychological personnel became available for duty on this investigation. He reported to the Surgeon General to select and ship records from the files of the Section of Psychology to the Port of Embarkation, where initial work was already in progress. A week later he was ordered to U. S. A. Laboratory, Port of Embarkation, New York City, for duty in connection with the statistical treatment of the records.

The personnel at the laboratory, in charge of Lieut. Col. Edwin H. Schorer, varied from seventeen officers, enlisted men and women during July and early August to five officers and assistants in early September. Different officers from time to time awaiting their discharge were assigned for but a few days, whereas Second Lieutenant Conrad Erwin Ronnenberg, Sanitary Corps, and Lieutenant Henry S. Weigle, Medical Corps, were indispensable collaborators throughout the whole period of the work at the port of embarkation.

Major Kofoid left the service on August 8th and Major Riley left the service on September 6th, leaving the work in charge of Captain Myers, who again reported at the office of the Surgeon General on September 10th to complete the study. Upon his arrival, it was found that inordinate demands upon the statistical department eliminated all hope of final Hollerith tabulation of the data and it appeared that completion of the study would have to be postponed indefinitely. However, through the interest and initiative of Colonel Joseph F. Siler, Medical Corps, of the Laboratory Division and Colonel F. F. Russell, Medical Corps, of the Army Medical School, two enlisted men were assigned to assist Captain Myers in assembling the data by the traditional method of hand tallying. Frequency tables were thus completed in about three weeks. Sergeant Benjamin M. Oppenheim was then loaned by the Division of Coordination, Organization and Equipment to plot the graphs.

Thus it will be perceived that Major Kofoid initiated the study and the larger machinery for its execution; Major Riley supervised the greater portion of the work assembling the data for this study at the port embarkation; and Captain Myers is responsible for the final assembling and treatment of data with their interpretations.

The methods of pulling intelligence rating cards was as follows: Each time a card of a hookworm soldier was found, another card was paired with it, of a soldier, reported on hookworm rosters as not having hookworm, and whose home address was of the same county as that of the hookworm case with whose card it was paired.

The study was started with the hope to compare 10,000 hookworm cases paired with 10,000 non-hookworm cases from the same local areas in terms of home addresses. However, owing to the frequent disparity between the groups and organizations surveyed for hookworm and the groups and organizations surveyed by the intelligence rating boards (since the latter boards were organized in some camps subsequent to the earlier hookworm surveys) and to the absence of necessary data either from the hookworm rosters or from the intelligence rating cards, only 6,639 hookworm and 6,639 non-hookworm cases were studied, of which number of each there were 612 cases of colored troops.

In every instance where two or more examinations had been given, that score was counted which on the basis of the equivalent mental age scale as per the Psychological Examiner's Guide, page 91, gave the highest record. All Alpha and all Beta records were assembled in separate tables and all individual-tests records were merged with Alpha and Beta scores into a common scale on the basis of equivalent mental ages, which in turn were converted into equivalent letter ratings as per Examiner's Guide, page 91.

The statisticians[1] in the Section of Psychology of the Surgeon General's Office who had developed these mental age and letter rating equivalents to meet an urgent need during the war, had found in a later study that these equivalents were but roughly accurate. Consequently they, with the help of Karl Pearson, developed by an elaborate and exhaustive study the groundwork of very refined equivalents. However, these statisticians left the service before a table was developed applicable for this study. Certainly then the ratings of this study, which are indicated by the "Common Scale," are not so exact as they ought to be; yet they are the best which the available standards offered as expedient.

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[1] Mr. Carl R. Brown and Lt. Mark A. May.

In addition to the intelligence rating the chronological age and years of schooling were taken into account. Rank also was noted early in the study but because the intelligence record cards—as would be expected since they were taken soon after the recruits entered camp—listed practically all soldiers as privates, rank difference proved sterile for this study.

Furthermore, the record cards were pulled on the basis of " heavy territory " and " light territory," the former meaning a county in which the army hookworm survey indicated more than 10% of recruits infected with hookworm; the latter, less than 10% of recruits infected. In case, then, an intelligence record card was found of a soldier infected with hookworm, whose home address was in a light county, the intelligence record card of a non-hookworm soldier from the same county was pulled.

With the negroes, whose intelligence rating cards as well as hookworm survey rosters were sometimes designated as merely from Texas, say, or Tennessee, it was almost impossible to compare light territory and heavy territory groups. This fact, in addition to the relatively small number of cases, explains why the colored troops are limited to one general table of comparison of hookworm cases with non-hookworm cases.

RESULTS

TABLE I

PER CENT DISTRIBUTION OF RATINGS

All White Troops

	Alpha		Beta		Com. Scale	
	Hook-worm	Non-hook-worm	Hook-worm	Non-hook-worm	Hook-worm	Non-hook-worm
A	1.2	3.0	0.7	1.1	1.5	3.5
B	4.4	7.9	1.1	2.2	4.6	8.2
C+	11.5	16.6	2.2	4.2	7.3	10.9
C	26.9	29.6	10.6	14.1	23.7	27.4
C—	30.3	25.2	27.6	25.6	34.8	29.6
D	17.4	11.7	40.1	36.9	19.3	14.5
D—	8.1	5.8	17.4	15.7	8.5	5.9
			White Troops (Heavy Territory)			
A	1.1	2.6	0.6	0.9	1.3	2.9
B	4.8	7.4	0.9	2.1	4.6	7.3
C+	12.3	17.1	2.2	3.8	7.0	10.3
C	27.0	30.7	10.0	14.0	22.5	26.7
C—	30.7	24.8	27.9	26.0	34.8	29.7
D	16.8	11.3	41.9	38.2	21.0	16.5
D—	7.3	6.1	16.5	15.0	8.8	6.6
			White Troops (Light Territory)			
A	1.4	3.6	1.2	2.3	1.8	4.7
B	4.0	8.7	1.9	2.5	4.6	9.8
C+	10.4	16.0	2.3	6.0	8.1	12.1
C	26.8	28.1	12.9	15.0	26.2	28.7
C—	29.8	25.8	26.7	24.0	35.0	29.5
D	18.2	12.3	34.2	31.0	16.2	10.8
D—	9.4	5.5	20.8	19.2	8.0	4.4
			Colored Troops			
A	0.0	0.0	0.7	1.3	0.7	1.6
B	1.8	1.5	0.7	2.9	1.1	2.0
C+	1.8	3.5	1.4	3.6	1.0	2.8
C	6.2	10.4	5.2	5.2	5.0	7.2
C—	17.3	14.8	11.0	11.4	15.2	18.8
D	16.7	22.3	37.2	33.3	38.4	35.9
D—	56.2	47.5	43.8	42.2	38.6	31.7

TABLE II

MEDIANS OF HOOKWORM CASES VS. MEDIANS OF NON-HOOKWORM CASES

White Troops

	Alpha		Beta		Com. Scale (Mental Age)		Age (Chronol)		Schooling	
	Number	Median	Number	Median	Number	Median	Number	Median	Number	Median
Total Cases Hookworm	3546	40.5	2251	40.6	6027	12.26	5930	24.2	4456	6.1
Total Cases Non-Hookworm	3940	51.4	1950	43.2	6027	13.00	5796	25.0	4597	6.7
Hookworm Inferiority		10.9		2.6		.74		.8		.6
Per Cent Inferiority		21.2		6.0		5.70		3.2		8.9
Hookworm Heavy Territory	2083	41.8	1731	40.6	3972	12.34	3911	24.3	3154	6.0
Non-Hookworm Heavy Territory	2310	51.8	1596	42.8	3972	12.83	3860	25.1	3260	6.4
Hookworm Inferiority		10.0		2.2		.49		.8		.4
Per Cent Inferiority		19.3		5.1		3.8		3.2		6.2
Hookworm Light Territory	1463	39.3	520	40.5	2055	12.46	2019	23.9	1302	6.5
Non-Hookworm Light Territory	1630	50.8	354	44.8	2055	13.32	1936	24.8	1337	7.7
Hookworm Inferiority		11.5		4.3		.86		.9		1.2
Per Cent Inferiority		22.6		9.6		6.4		3.6		15.6
Colored Troops										
Hookworm	162	12.6	290	23.8	612	10.04	600	23.7	340	3.5
Non-Hookworm	202	16.1	306	24.0	612	10.50	602	24.4	313	4.1
Hookworm Inferiority		3.5		.2		.46		.7		.6
Per Cent Inferiority		21.7		.8		4.4		2.9		14.6

TABLE III

Average Numerical Score of Successive Ten Per Cent Steps From Highest to Lowest.

All White Troops

	Alpha		Beta		Com. Scale	
	Hookworm	Non-Hookworm	Hookworm	Non-Hookworm	Hookworm	Non-Hookworm
1st (highest) ten per cent	111.7	128.9	80.4	87.2	16.7	17.5
2nd " " "	78.5	95.2	65.2	69.9	14.5	15.8
3rd " " "	63.3	78.2	54.6	61.5	13.6	14.6
4th " " "	52.7	65.4	49.1	53.3	12.9	13.7
5th " " "	44.1	55.4	43.1	45.7	12.3	13.1
6th " " "	36.5	46.4	35.9	39.3	11.7	12.4
7th " " "	30.3	38.8	29.0	33.4	11.2	11.8
8th " " "	24.2	30.2	23.8	25.2	10.6	11.1
9th " " "	18.8	22.6	17.8	19.1	9.8	10.2
10th " " "	10.5	12.2	8.0	8.1	8.6	8.9
Colored Troops						
1st (highest) ten per cent	71.1	80.2	74.6	86.3	14.6	16.1
2nd " " "	35.9	44.6	49.4	61.5	11.5	12.5
3rd " " "	25.7	29.8	35.4	45.2	10.6	11.3
4th " " "	19.2	21.8	31.1	34.4	10.0	10.6
5th " " "	14.0	17.3	26.0	27.2	9.9	10.1
6th " " "	11.5	13.1	20.1	21.0	9.5	9.7
7th " " "	6.9	9.9	14.4	16.2	9.0	9.4
8th " " "	6.4	6.7	10.6	12.2	8.7	8.9
9th " " "	2.0	2.0	7.0	6.9	8.3	8.5
10th " " "	2.0	2.0	2.2	3.5	7.4	7.7

Table I shows the comparative distribution by letter ratings of hookworm and non-hookworm groups for Alpha, Beta and "Common Scale," for all white troops, for white troops of light territory and of those of heavy territory, and for all colored troops. Median numerical scores for Alpha and for Beta, median mental age (Common Scale), median chronological age and median number of years attending school are given under corresponding legends in Table II. These distributions of ratings of ages and years of schooling with their respective medians are all presented graphically in plates 1-22.

Furthermore, all the hookworm troops are compared with all the non-hookworm troops in respect to successive 10% increments in Alpha, Beta and "Common Scale," as shown in plates 17-22.

Data from which these graphs are constructed are given in Table III.

Analysis and Interpretation

By reference to Tables I and II it is found that the intelligence of hookworm troops is lower than for the non-hookworm troops; that they have fewer years of schooling; and that they are younger chronologically. Mere inspection of the tables show these differences to be unmistakable and to be based on such a large number of cases as not to warrant computation of a mathematical probable error of these differences.[2] Furthermore, all these differences are greater for white troops from "light" territory than for those from "heavy" territory and, in most cases, greater for the white troops than for the colored troops.

Moreover, when, according to Table III and graphs, plates 17-22, hookworm and non-hookworm troops are compared by average score of successive 10% steps from the highest to the lowest, it is clear that the difference in intelligence rating between hookworm and non-hookworm troops of the lowest level of intelligence is comparatively slight. From this it is safe to infer that the lower the intellectual scale, the less the relative inferiority of the hookworm troops.

So much for the data. What do they mean? Before offering an interpretation, let there be a critical survey of earlier studies of similar problems. The first study designed to measure the influence of hookworm disease on intelligence was made on school children by E. K. Strong under the auspices of the Rockefeller Foundation, in 1916.[3]

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[2] It should be noted that the sum of the Alpha cases and of the Beta cases of hookworm and non-hookworm groups, respectively, do not quite equal the total number for each group in the "Common Scale" column, since the difference was made up by the individually examined cases. Likewise the total numbers for the age and schooling columns do not, as they should, equal the totals of the Common Scale column, since some troops failed to note their age, some their schooling, and some, both.

From his study, Strong concludes:

1. " Hookworm disease interferes very radically with mental development."

2. " Treatment alleviates this condition to some extent, but it does not, immediately at least, permit the child to gain as he would if he had not had the disease."

3. " The longer the child has the hookworm disease, the less will be the improvement mentally when the child is treated."

4. The last statement Strong considers as " probably the most important deduction from this whole study."

Such are Strong's conclusions, which corroborate the average man's casual observation of the apparent effect of hookworm disease and, in support of which, all who are interested in stamping out the disease are eagerly waiting for conclusive scientific data. *But neither Strong nor anyone else has yet produced such data.*

Strong compared the gains made in several of the then most highly standardized single group intelligence tests after a period of three and a half months by the following group of school children:

18 children without hookworm.
9 untreated hookworm children.
27 completely cured hookworm children.
17 incompletely cured hookworm children.

All these children were given the Binet-Simon Test, in addition to seven other mental tests, calculation test, logical memory, opposite test, memory span, handwriting, form-board test, all of which, together with the Binet test were repeated after an interval of three and a half months. The difference between chronological age and Binet age for the respective groups was found to be: non-hookworm children, —1.0 year; completely cured hookworm children, —1.6 years; incompletely cured hookworm children, —2.2 years; and untreated hookworm children, —1.2 years. According to the chronological age distribution for the various groups, all the non-treated hookworm children fall between the ages 9.9-10.9 years, while all the other groups are rather evenly divided between the age intervals 9.9-10.9 years and 11-12 years.

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[3] Effect of Hookworm Disease on the Mental and Physical Development of Children. N. Y. The Rockefeller Foundation, 1916.

Now it has been pointed out that for ages above 10.5 or 10 years, mental age cannot be accurately determined by the old Binet test, which fact Strong himself records in a footnote of his study (page 74). Of this shortcoming of the old unrevised Binet test which was used by Strong, Terman has to say the following: "The proportion of feeble-mindedness among adult subjects was greatly overestimated, because subjects who were really of the 12 or 13 years mental level could only earn a mental age of about 11 years."[4] He finds furthermore that young subjects get too high a mental age: "In young subjects the higher grades of mental deficiency were overlooked, because the scale caused such subjects to test only a little below normal."

There is a very high probability then that Strong's mental ages are not the true mental ages and that the non-treated hookworm group, a comparatively young group, had a mental age deficiency of considerably over 1.2 years; and that since all the other groups fall pretty heavily into the 11 to 12 age group, their mental age deficiency found by Strong is too great. Indeed, on the basis of the age distribution of the groups it is highly probable that for increasing order of mental age deficiency the groups stand: non-hookworm children, completely cured hookworm children, incompletely cured hookworm children and untreated hookworm children.

Strong's data on the social status of the groups help corroborate this probability, for of the non-hookworm children 94% came from the best grade of homes, 0% from the poorest. Of the completely cured hookworm children 41% came from the best grade of homes, 15% from the poorest. Of the incompletely cured hookworm children 12% came from the best grade of homes, 29% from the poorest. Of the untreated hookworm children 33% came from the best grade of homes, 56% from the poorest. This is considered a corroboration of the assumption that better social environment on the whole presupposes a higher level of intelligence in that environment. Considerable data[5] are available in support of the latter assumption.

It so happened that on the whole the gains in the second trial of the several mental tests (other than Binet) classified the groups in the order, non-hookworm children, completely cured hookworm children, incompletely cured hookworm children and untreated hookworm children, which is the same order as the very highly probable mental age order of the groups to start with, as was shown above. *If the latter be true, then the order of gain is but to have been expected, hookworm or no hookworm.* It is now generally accepted as a fact that the more intelligent learner learns the more rapidly. Strong[6] himself has furnished data elsewhere which he apparently had forgot when interpreting his data on hookworm. He concludes from an experiment on school children:

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[4] The Measurement of Intelligence, Lewis M. Terman, p. 3.

[5] Lewis M. Terman, The Measurement of Intelligence, pp. 72-73.
Robert M. Yerkes, James W. Bridges, Robert S. Hardwick, A Point Scale for Measuring Mental Ability.

" The slope of learning curves of school children based on simple arithmetical combinations apparently correlates to a very considerable extent with the general intelligence of the children." A few years previously Colvin, practicing five normal subjects with five subnormal at canceling A's, found that " in every case the normal child made greater improvement with less fluctuation than did the subnormal child."[7]

Likewise the writer found from a card sorting practice on 27 normal school students for 50 minutes a day, with the practice repeated after 10 days, 11 days and 3½ months, respectively, a positive correlation of +.48 between maximum gain and intelligence, when there was no correlation between initial performances and intelligence. This indicated pretty clearly that the +.48 correlation showed a very real positive relationship between intelligence and learning ability. It should be noted that " intelligence " was determined by having each student rank all the other students of the class on the basis of her estimate of each student's intelligence, from which a combined ranking was computed.[8]

Assuming, then, that the four groups studied by Strong had at the beginning of the study mental capacity in the order,—non-hookworm children, completely cured hookworm children; incompletely cured hookworm children, and untreated hookworm children; which his difference between chronological and mental ages (p. 21) indicates when these data are interpreted in the light of Terman's Revision of the Binet tests, that the gain, therefore, for these groups after 3½ months should show exactly that order is just what should be expected, regardless of hookworm. *Apparently, then all Strong's study has shown is that brighter children learn faster than duller children.*

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[6] Learning Curve as a Diagnostic Measure of Intelligence,—Psychological Bulletin, 1917, Vol. 14 pp. 153-154.

[7] S. S. Colvin, Notes on Certain Aspects of Learning—Psychological Bulletin, Feb. 15, 1915, Vol 12.

[8] Garry C. Myers, Some Variabilities and Correlation in Learning. Amer. Jr. Psychol. July, 1918, Vol. 29 pp. 316-326.

Since completing this study the writer has demonstrated in a practical way that learning progress is in proportion to intelligence ratings, in a school of 1,800 illiterates whom he classified on the basis of intelligence ratings. See Principles, Plans and Purposes of the Recruit Educational Center, Camp Upton, N. Y., War Department, Washington, D. C.

It must be said of Strong's work that his method of attempting to measure the effect of hookworm on mental development in terms of relative learning gains by hookworm and non-hookworm children is highly commendable. His method, if refined by comparing groups of equal mental and social status, on the basis of their learning rate as measured by learning curves developed with considerable practice on specific learning tasks and on large number of children, should help measure with a good deal of exactitude the influence of hookworm disease on intelligence.

Strong also studied 11 children—not included in the part reviewed above; who on the average were 13.5 years of age, comparing this group with the 17 incompletely cured hookworm children averaging 11.1 years chronologically, both groups coming " from homes of approximately the same economic conditions." The average mental ages for the respective groups, by Binet-Simon tests, were found to be 9.0 years, and 8.5 respectively, from which are derived intelligence quotients of .67 and .77. Of course, here again the real difference is not quite so great if the error of Binet for the older children is taken into account. Nevertheless, it is obvious that the older group of 11 children, as pointed out by Strong, is appreciably lower intellectually, which fact would presuppose a lower rate of gain by them, which gain was 1.5% as against 5.9% for the younger group. " When the two groups are compared with normal children, we see that the younger children have gained but 34% of what the healthy children accomplished, while the older children have gained but 9%." It should be recalled that this " normal " group had an average chronological age of 11.1 years and mental age of 10.1 years, giving an intelligence quotient of .91. Certainly, therefore, Strong is not justified because the older hookworm children with lower intelligence gain less than the younger hookworm children of higher intelligence, in concluding: *" The longer the child has the hookworm disease the less will be the improvement mentally when the child is treated."* And not justified in spite of the fact that he notes, " Our careful study made of these children (*the 13.5 year old children*) did not reveal any other cause for the retardation than hookworm disease." *Here again he has merely shown by his data that the brighter children learn faster than the duller children, which is to be expected.* Furthermore, it is not clear on what ground Strong assumes that the 13.5 year old children with hookworm have had the disease longer than the 11.1 year old children.

In 1917 Truman Lee Kelly[9] reported a study in which his results disagree with those of Strong's to the effect that children cured of hookworm improve more rapidly in mental traits after cure than do the normal children.

He too had a small number of cases in the groups compared:

47 children free from malaria and hookworm.
9 children cured of hookworm.
11 children cured of malaria.
11 children cured of malaria and hookworm.

The tests were Starch, Arithmetic, Courtis Arithmetic, Trabue completion and Thorndike Reading tests, which were repeated after a six months' interval. Kelly gives no indication as to the mental status of the group compared at the time of the first test. Furthermore, since he depended upon the children's report as to whether or not they had malaria one is not sure this factor is wholly eliminated from the "free-from-malaria and hookworm" group.

If number of cases were the solution of this problem, the solution should have been near at hand upon the report of Waite's Study,[10] wherein he tested 116 non-infected children, 65 lightly infected children and 159 heavily infected children, with Goddard's Revision of the Binet-Simon Tests, and the Porteus Mazes. Waite classified his group in this way:

"1. The heavily infected cases presenting hookworm ova in plain smear examinations of stools;

"2. The lightly infected cases, presenting hookworm ova only in smears of centrifuged stools; and

"3. The non-infected cases, who showed no ova in four successive stool examinations, two of plain smears, and two of centrifuged smears."

Expressed in mental age the retardations for the respective groups for Binet and Porteus tests were as follows:

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[9] Effect of Malaria and Hookworm upon Physical and Mental Development of School Children. Elementary School Journal, Vol. 18, 1917, pp. 43-55.

[10] Dr. G. H. Waite, A Study of the Effects of Hookworm Infection upon the Mental Development of North Queensland School Children. The Australian Medical Journal Jan. 1919. The original manuscript dated 1918 was loaned the writer through Major John L. Riley, by the Library of the Rockefeller Foundation.

	Non-Infected	Lightly Infected	Heavily Infected
Retarded by Binet...	3.9 mo.	9.3 mo.	23.4 mo.
Retarded by Porteus	2.7 mo.	4.7 mo.	16.00 mo.

Unfortunately Waite computed the average retardation rather than the median, thereby giving undue weight to the extremely low cases. Nevertheless, these data show conclusively that the hookworm children studied are on the average more retarded mentally than the non-hookworm children, and the heavily infected group is more retarded than the lightly infected group. But they do not conclusively support the inferences derived therefrom by Waite, wherein he concludes:

1. " The results bring to light clearly two features, namely, that hookworm infection produces in growing children severely arrested mental development, and considerable mental sluggishness."

2. " The duration of hookworm infection is important, because the longer the infection persist the greater is the mental retardation."

3. " The degree of hookworm infection, and therefore the amount of anemia, definitely influences the amount of retardation of mental development."

4. " The most backward hookworm children invariably give the history of an early infection."

Considering Waite's first point, there arises the ever-present problem in interpretation of such data which he seems wholly to ignore, namely, how is anyone to know from any data which merely shows the hookworm group inferior in mental rating whether the inferiority is due to hookworm or whether because of their inferiority such children were of poor sanitary habits, thereby more exposed to the infection? In other words, to what degree does hookworm select the lower level of intelligence? Certainly Waite is not justified by the data he furnishes in making his first conclusion. On the basis of his data one could infer with just as much logic that " severely arrested mental development, and considerable mental sluggishness " tended to make the children easy victims to hookworm.

The validity of Waite's succeeding inferences hangs upon that of his first one.

In the study of Major Kofoid and Pittenger (see this paper, p. 211), their comparative data expressed in 10% steps from the highest to the lowest for hookworm and for non-hookworm cases, respectively, indicate an even more pronounced tendency at convergence toward the lower extreme than does this study. Here are their data for Alpha:

	501 Hookworm Cases Aver. Score	4,792 Non-Hookworm Cases Aver. Score
1st (Highest) 10%	181.0	219.0
2d " "	146.6	178.5
3d " "	118.6	150.6
4th " "	99.0	127.7
5th " "	80.4	107.4
6th " "	63.5	89.6
7th " "	48.7	70.7
8th " "	36.1	51.3
9th " "	24.6	31.8
10th (Lowest) 10%	1.0	0.0

Median score.

Although their data were given in weighted scores which are about twice the unweighted scores in the present study, thereby rendering the two sets of data not wholly comparable, yet the general tendency is the same as that shown by our data. Of course their relative inferiority of the hookworm group is very much greater than that for our study, they also found a greater increase of difference from the lowest mental level to the highest. This is to be expected since their negative group was selected at random including troops undoubtedly from the larger urban populations and other non-infected or lightly infected areas, whereas each of our hookworm cases was paired with a non-hookworm case from the same local territory. They also found in accord with our data, that the relative inferiority of the hookworm troops was much greater for whites than for colored and greater also for Alpha troops than for Beta troops.

Interpreting these data Kofoid and Tucker say: "In literate blacks the difference is less, as might be expected, because of a relative racial immunity." They conclude:

"The interpretation of the data is that men infected with hookworm belong to all classes of mental rating, but not wholly proportionately in all groups to those without the infection, the men with the low scores showing a greater relative deficiency as the score falls. It also appears that the infected men are pushed *en masse* below the normal by infection by hookworm, or by other factors correlated therewith in a vicious circle, but that the men with lower scores have a greater momentum and move relatively farther from the norm than do infected men with higher scores. This suggests the conclusion that men with hookworm include a greater proportion of subnormal types than men without and that subnormal men tend to acquire the disease more rapidly than men of higher categories. It is also possible that the intensity of individual infections may be heavier in the groups of lower intelligence, due to the relation of intelligence to sanitation, which in turn modifies the chances of infection and thus the ultimate intensity thereof."

As for the negroes, they logically fit into the lower order, consequently showing, as do the lower whites, a comparatively small inferiority for the hookworm group. Then the question may arise why is not the convergence consistent from the highest to the lowest extremes of intelligence instead of a rather sudden convergence toward the lower extreme? The answer may be that with the exception of the lowest 30 or 40% of the intelligence scale of a community, there is hardly to be expected a great improvement in sanitary habits near the more intellectual extreme. Certainly the degree of rise in standards is hardly proportional all the way upward. On the other hand, just why should the very upper extreme of the hookworm and non-hookworm groups be actually closer than the mean where there is a slight bulging in the space between the curves? Undoubtedly this is due to a failure of Alpha to differentiate as widely in intelligence scores for the upper extremes of intelligence. In the numerous studies of Alpha by the Division of Psychology it was invariably found that, on the basis of a man's military value, Alpha did not clearly discriminate between the upper and lower A grade man, nor even always between the A and B man.[11] Furthermore when given to college men, the discrimination in terms of intelligence rating is certainly not very pronounced.[12]

On the other hand, the convergence at the lower extreme may mean that hookworm disease in some peculiar way does not affect persons of very low mentality or even those of very high mentality or that the effect is so small as to be registered but slightly or not at all by an intelligence test. In this event the difference between the hookworm and non-hookworm groups would undoubtedly be due to hookworm infection.

If two groups, say from northern states where hookworm is practically absent, whose median mental status were known to be quite disparate, were compared on the basis of 10% steps, comparison with such data would help clear up the difficulty in interpreting the lack of complete parallelism between the 10% steps of the hookworm and non-hookworm groups of this study.

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[11] Psychological Examining in the United States Army, Part III. P. published by the National Academy of Sciences, Vol. XV.

[12] School and Society, Vol. X, No. 250, pp. 437-440.

In reading the data of Table I care should be exercised in interpreting per cents of difference in respect to all mental ratings since a year's difference between mental ages 7 and 8 years cannot mean the same as a year's difference between 11 and 12 years, nor in terms of per cent, since even in spite of intelligence scales there is no certainty that the increments in terms of mental age or even in terms of Alpha or Beta scores are constant. Let such per cents merely be read as ratios to the higher values compared and no more.

Relation of Schooling to Hookworm

When the amount of schooling reported is considered the data are no more conclusive in what they mean, for very high correlations were found between the army group tests and amount of schooling.[13]

Just what the high correlation between intelligence rating and schooling means is not certain, i. e., one does not know how much schooling offsets ability to score in the army tests nor to what degree the amount of native ability determined how long school had been attended. In this study exactly the same problem arises: Did hookworm disease decrease the amount of school attendance or was the kind of children whose school attendance was limited, of those children who most readily fell heir to the disease? Maybe such children were those less likely to have shoes and not having so much schooling and not coming perhaps from so good a social environment would not have developed so good sanitary habits.

Relation of Age to Hookworm

Since all the troops from among whom the cases selected were of practically the same age distribution, it is quite significant that the hookworm troops are from .7 to .9 of a year younger than the non-hookworm troops.

According to the report of the Porto Rico Commission,[14] there was found the following age distinction:

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[13] Psychological Examining in the Army, Part III. National Academy of Sciences, Vol. XV.

[14] Ashford and Jgaravidez, Uncinariasis in Porto Rico, Sen. Dec. 808, Washington, D. C., 1911.

Age	*Cases*
Under 10 years	15,622
10 to 20 years	50,924
21 to 30 years	36,589
31 to 40 years	18,254
41 to 50 years	8,796
51 to 60 years	3,841
Over 60 years	1,413

Although the cases examined were not exactly a random sampling, these figures doubtless represent the approximate age distribution, and are slightly suggestive of a corroboration of our findings.

A study reported by Major Siler and Major Cole in 1917 is more to the point.[15]

Of the First Mississippi Infantry 32% were infected, and the First Alabama Cavalry, 54%. The age distribution for the highest 10 years were as follows:

Years	*First Mississippi* %	*First Alabama* %
16-17	1	2
18-19	21	42
20-21	32	24
22-23	20	12
23-24	11	7

Obviously the First Alabama Infantry, a greater per cent of whose troops have hookworm, are younger than those of the First Mississippi. In the light of these data the writers inferred (p. 95):

"In our opinion there is but little or no doubt that age accounts to some extent for the greater prevalence of both hookworm disease and measles in the First Alabama Cavalry."

From this data and from the present study (see plate 25-28) it seems that the younger troops are more susceptible to hookworm disease than the older troops. Certainly more data is desirable as to the exact distribution of hookworm cases on the basis of total population at various ages and in various racial levels. However, it is also probable, since hookworm infection is limited in its length of life within a given individual, that many of the older men, who, in the hookworm survey fell into the non-hookworm group, had once been hookworm cases but had become free from hookworm at some time previous to the hookworm examination.

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[15] Major J. F. Siler, M. C. and Major C. L. Cole, M. C., The Prevalence of Hookworm Disease in the Fourth Texas Infantry, First Mississippi Infantry, and First Alabama Cavalry Regiment. The Military Surgeon, 1917, Vol. 41, pp. 77-99.

Conclusion

The average person of a given community, who is infected with hookworm, is inferior mentally to the average person, of the same community, who is not infected with hookworm. In support of this statement conclusive data have been presented.

But there are yet no data available to show conclusively whether this mental inferiority is due to hookworm disease or whether hookworm disease is due to mental inferiority.

A fact not calling for evidence here is that hookworm disease is a social and economic burden upon tropical and subtropical countries. Now if it does not in and of itself lower the mentality of its victim, there is ample evidence that it will, as will any other disease, diminish his educational opportunities, and thereby his efficiency as a social unit.

Since because of the very nature of the transmission of hookworm disease, wholly dependent upon remedial sanitary habits and conditions, doubtless it is true that just because of lower intelligence or lower mental training the victim more readily falls heir to the disease; hence the obvious remedy is more education to the educable, a far stricter governmental guardianship over the non-educable and over those educable to but a slight degree, and an aggressive general governmental control over the social habits and sanitary conditions of the community. In matters of education, mere ability to master the three R's should not be the goal alone, but through this median specific instruction in matters of simple rules of health and sanitation is of imperative necessity.

This emphasis upon specific hygiene instructions is obviously none the less imperative if it is discovered that the hookworm infection is primarily the cause of the relatively lower mental status of its victims.

So, then, whether hookworm disease is the cause of mental inferiority or the result, or both, the fact that those infected with the disease are, as a rule, distinctly inferior to those free from the disease, as shown conclusively by this study, is an inexorable challenge to the federal, state and local leaders in matters of health education and general economic and social betterment, to use every possible means to rid the country of this pest.

Suggestions for Further Research

The question remaining to be answered is, Does hookworm disease directly depreciate the mental status of its victims?

It has been seen that Strong's method of comparing gains in learning by the cured-of-hookworm children with hookworm children, while on the right track apparently, was fallacious in that it ignored the fact that ability to learn correlates highly with general intelligence; and, that as subsequent studies and as his own data indicate, almost any randomly selected hookworm group will be found to be of lower mental status than a non-hookworm group similarly selected.

It is necessary, therefore, in order to make a fair comparison, to be sure that the groups compared are at the time of the first learning test of practically the same mental ability with practically equal distribution of abilities in the groups compared.

Furthermore, the social status of the compared groups should be equal. A study of infected and non-infected children of the same family (especially of twins) would meet both conditions fairly well. That the social status be equalized in such cases would be obvious and that twins show far closer mental resemblance than siblings and siblings far closer resemblance than randomly selected children, has been well established by Galton,[16] Thorndike,[17] Rusk,[18] Cobb,[19] Starch,[20] and others.

In the absence of either class of subjects to be studied, the group intelligence tests available would enable the selection of groups of practically the same mental abilities.

If, then, of those two groups, the hookworm group learned appreciably more slowly than the non-hookworm group or cured-of-hookworm group, the obvious inference would be pretty safe.

The learning task should extend over a period of several weeks or months including numerous practices, thereby offering opportunities to measure mental endurance and attitude toward a task whose novelty has worn off and wherein the stimulation of a stranger as examiner has ceased to function as a stimulation.

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[16] Sir Francis Galton, History of Twins, p. 170 f of the reprint in Everyman's Library.

[17] E. L. Thorndike, Measurement of Twins, Archives of Philosophy, Psychology and Scientific Methods No. 1, 1905.

[18] Elizabeth Rusk, Mental Resemblance among Siblings. Teachers College, 1908, Masters Thesis, (unpublished)

[19] Margaret V. Cobb, A Preliminary Study of the Inheritance of Arithmetical Abilities. Journal of Educational Psychology 1917, Vol. 8,—pp. 1-20.

[20] Daniel Starch, The Similarity of Brothers and Sisters in Mental Traits. Psychological Review 1917, Vol. 24, pp. 235-238.

Assuming that the infection does not depreciate the mental organism structurally, even then in terms of attitude there would remain the question of functional depreciation. It is desirable then to devise a test to measure the attitude of the learner toward his task. Admittedly this is difficult of measure, yet, the difference in the learning gains by two groups who on setting out upon the task are of equal intelligence, should be a fairly good measure.

Suppose, for example, two such groups are tested at a given time and after, say six months, are retested, and show the same gains. Even then their learning abilities under normal procedure may not be proved equal; for if on the other hand the test had been repeated 75 times on as many days or if the children had been at regular school work with their teacher, the one group may have lagged in interest far more than the other.

Certainly the factor of attitude and of stimulation under peculiar conditions have not been carefully taken into account in some of the widely read experiments whose data seem to show, for example, that rebreathed but circulated air is quite as good for the child's mental function as freshened air or that there is no such thing as mental fatigue or that certain drugs have little or no impairing effect on mental functioning, when they offer no such conclusive proof at all.

Professor James, somewhere, has pointed out that few persons work up to the limit of their capacity; J. J. B. Morgan,[21] that subjects lifting weight not visible, by means of pulleys, tend to lift with the same speed, within certain limits, regardless of the intensities of the weights. It has been shown[22] that learners continue to improve under intensive practice to a very remarkable degree under stimulation of rivalry. In another study[23] the writer has shown that by learning against time, the ordinary learning record can be improved to surprising degree.

A learning test, then, over a long period of time, with many practices, on members of a large hookworm group compared with similar data on a large non-hookworm group, both of practically the same mental and social status at the beginning of the test, with the diagnosis and cure of the disease under control, should yield a definite answer to the question of the mental influence of hook worm disease.

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[21] J. J. B. Morgan, The Overcoming of Distraction and other Resistances. Archives of Psychology #35, Science Press.

[22] Garry C. Myers, Hazel Coburn, Helen Collins, School and Society 1918, Vol. 8 pp. 597-600.

[23] Garry C. Myers, Learning Against Time. Jr. Ed. Psychology, February 1915, pp. 115-116.

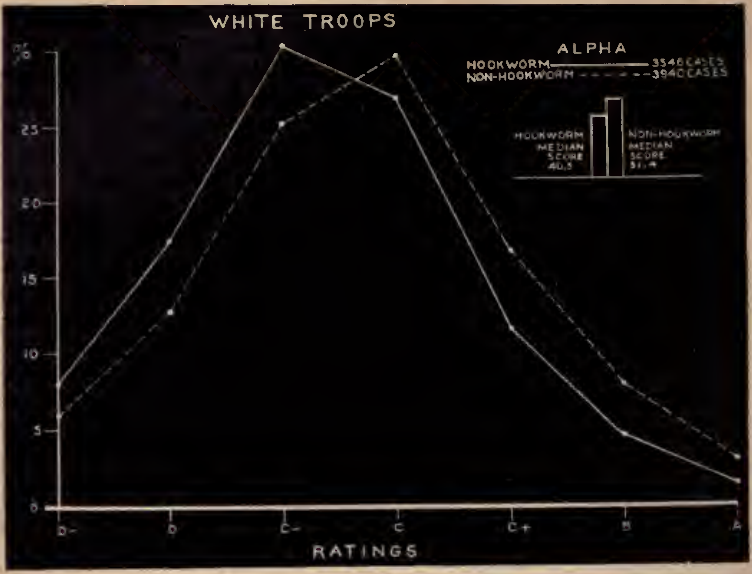


PLATE 1

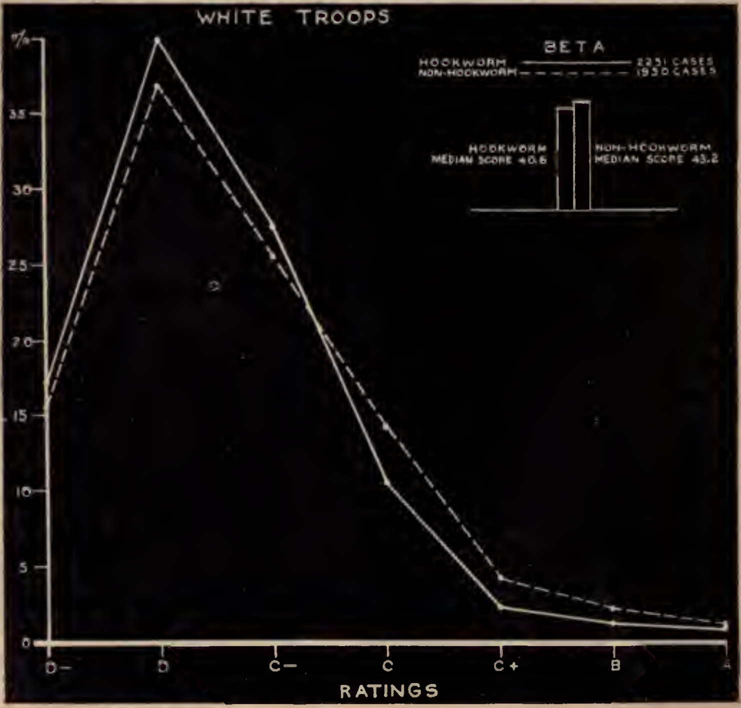
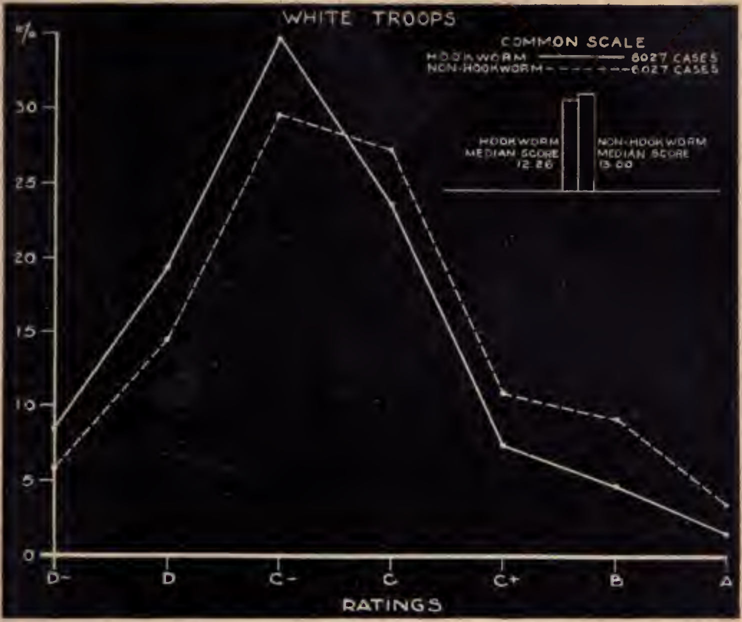


PLATE 2



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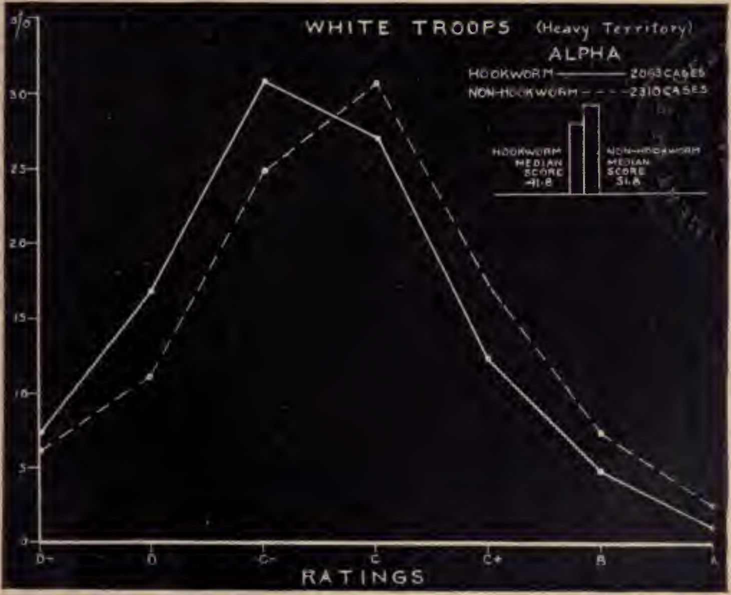

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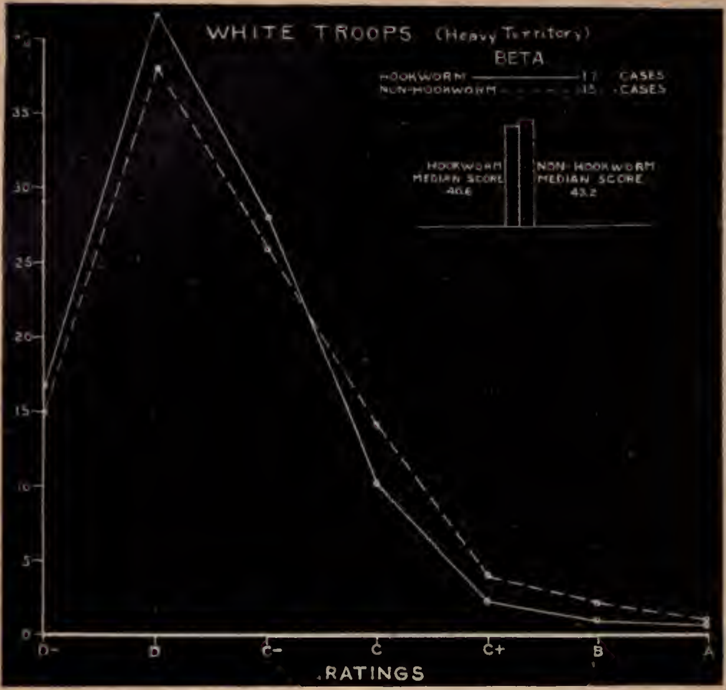

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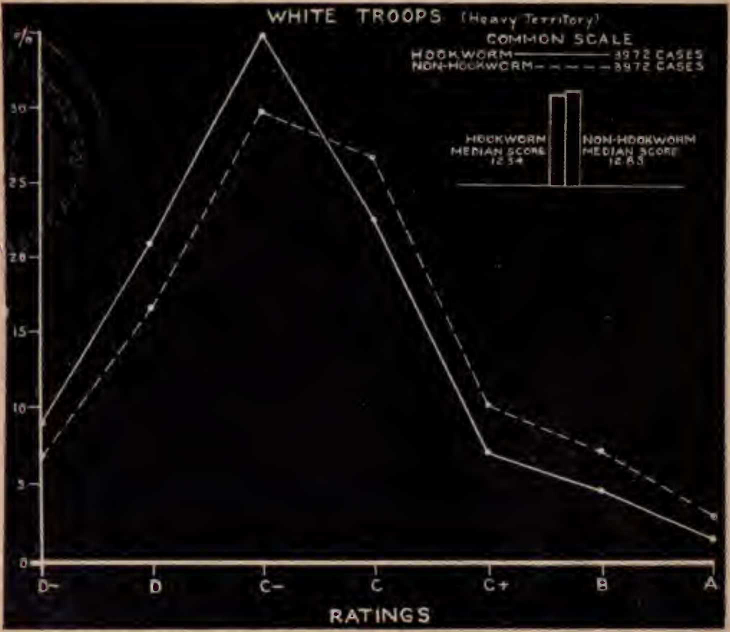

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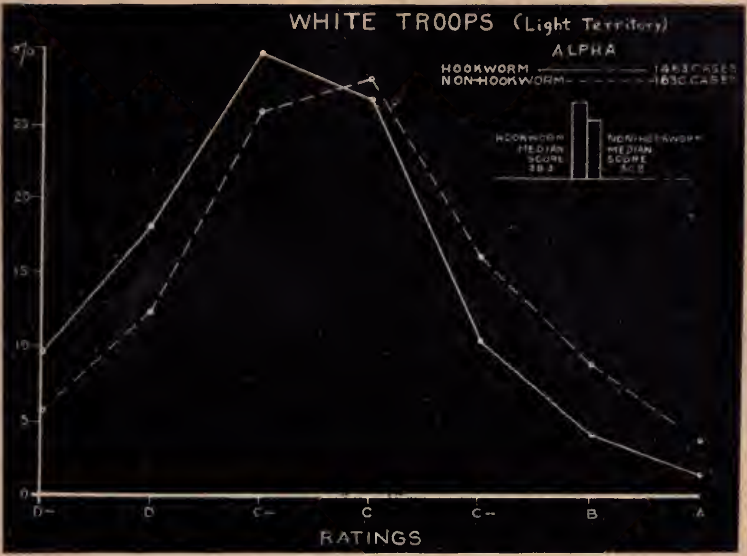

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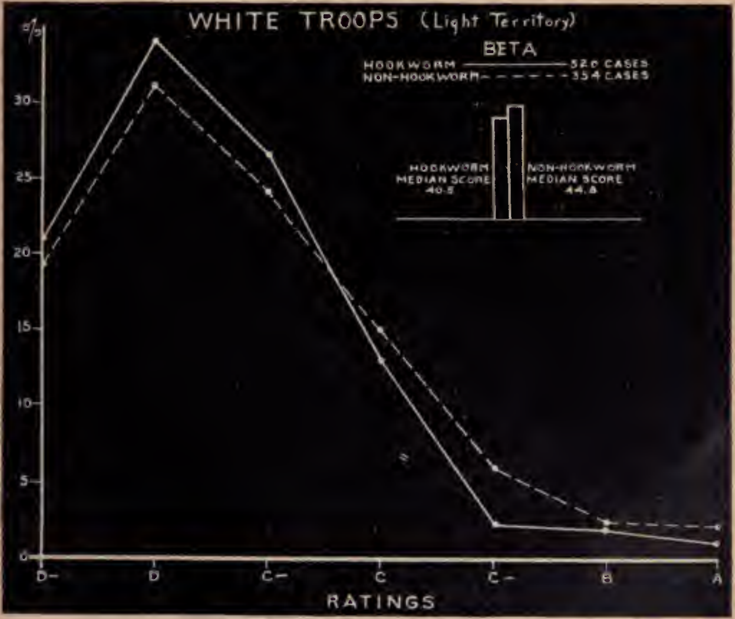

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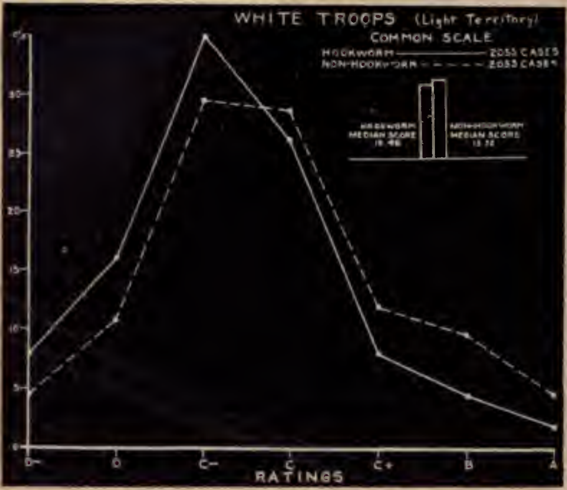

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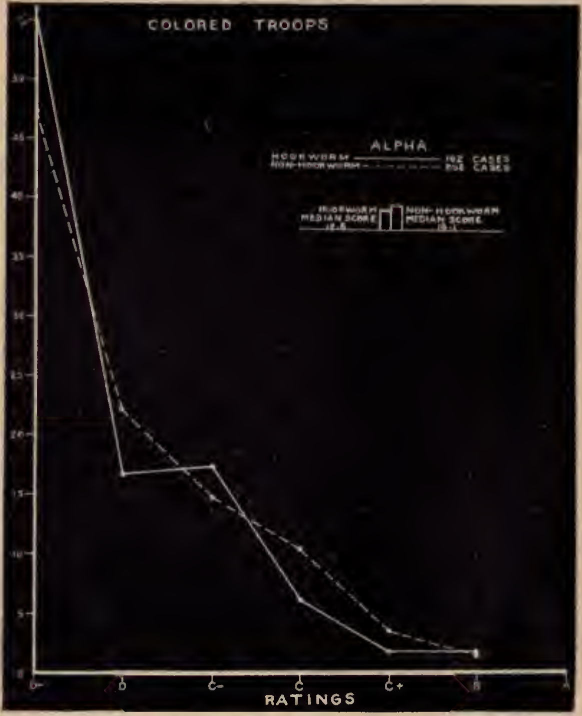

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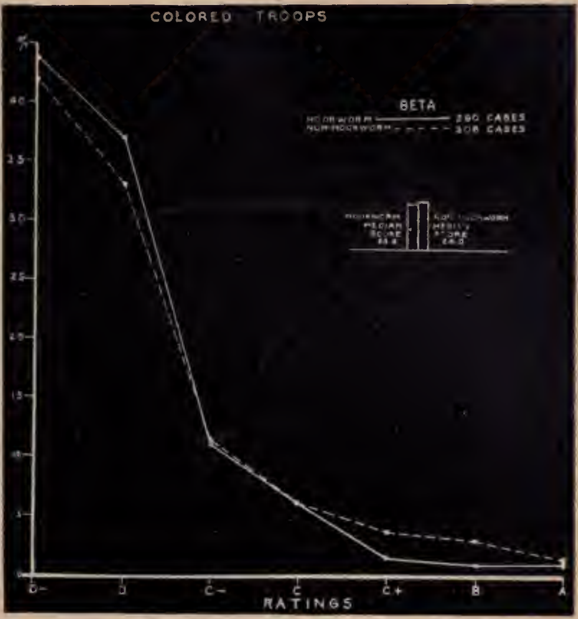

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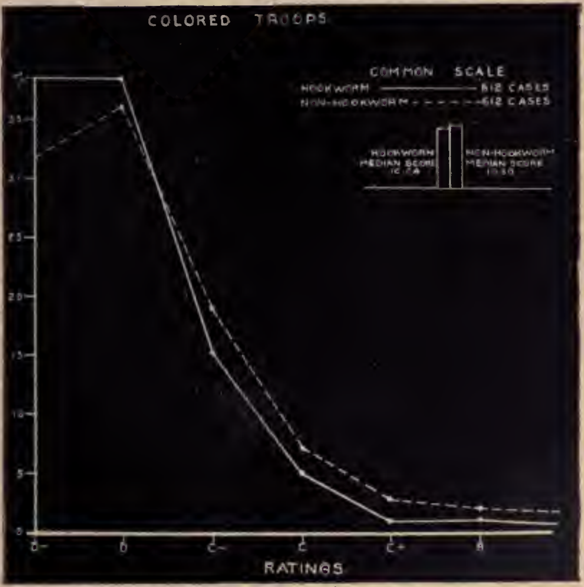

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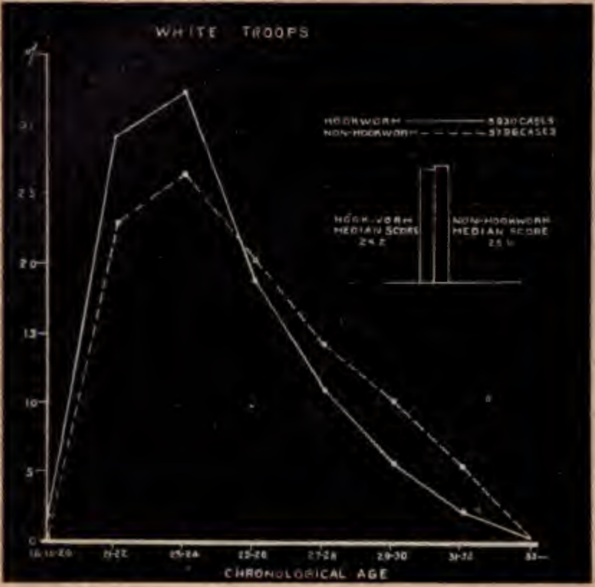

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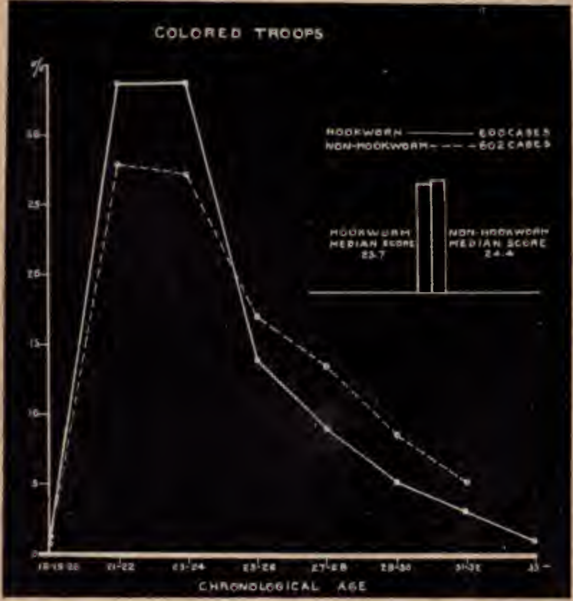

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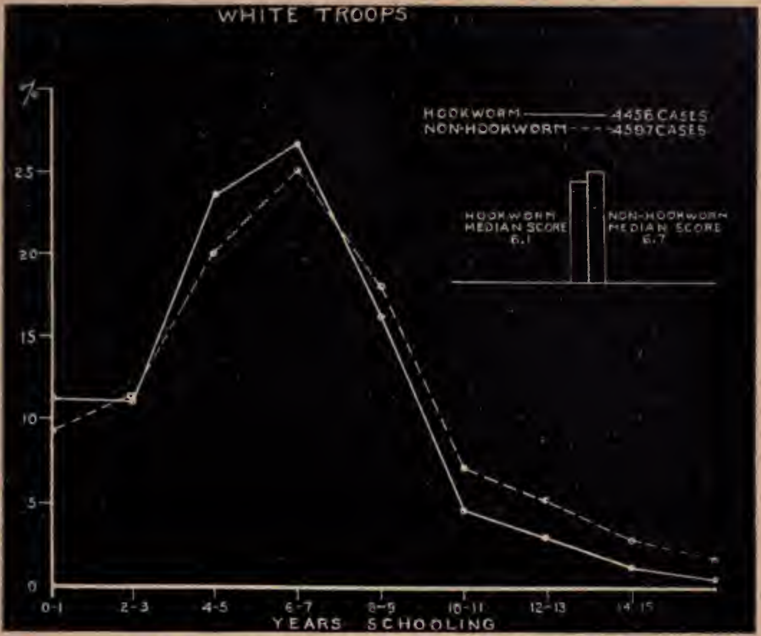

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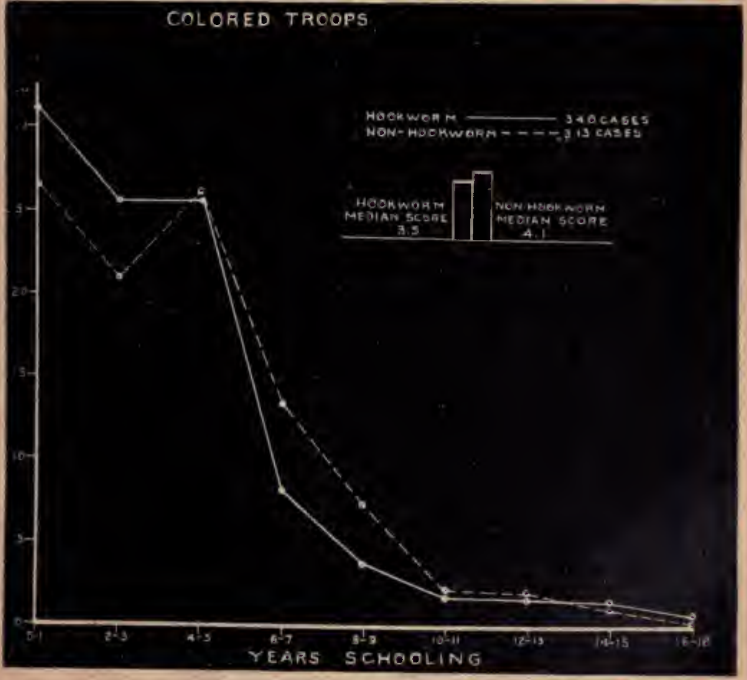

PLATE 16

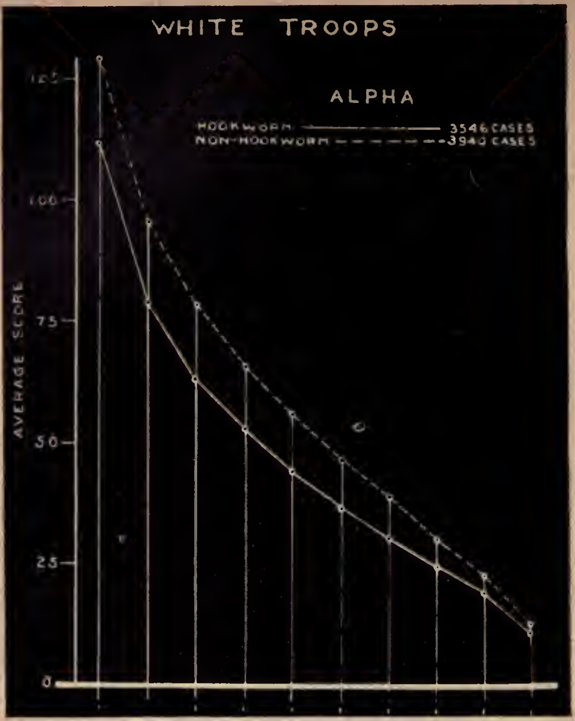

PLATE 17

SUCCESSIVE TEN PER CENT GROUPS

Highest 2nd 3rd 4th 5th 6th 7th 8th 9th Lowest
10% 10% 10% 10% 10% 10% 10% 10% 10% 10%

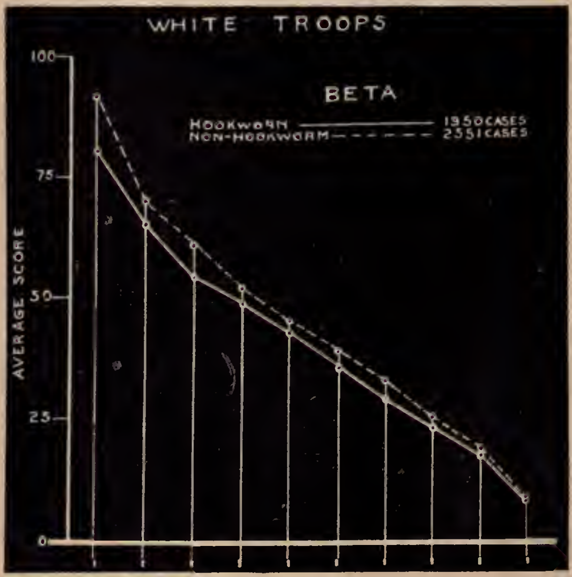

PLATE 18

SUCCESSIVE TEN PER CENT GROUPS

Highest 2nd 3rd 4th 5th 6th 7th 8th 9th Lowest
10% 10% 10% 10% 10% 10% 10% 10% 10% 10%

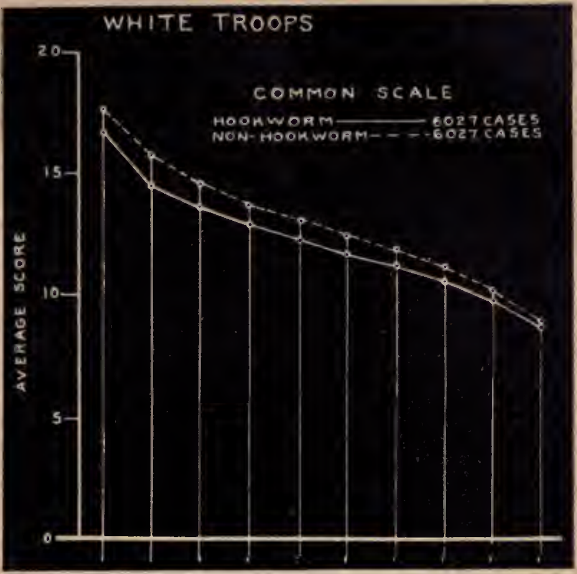

PLATE 19

SUCCESSIVE TEN PER CENT GROUPS

Highest 10% 2nd 10% 3rd 10% 4th 10% 5th 10% 6th 10% 7th 10% 8th 10% 9th 10% Lowest 10%

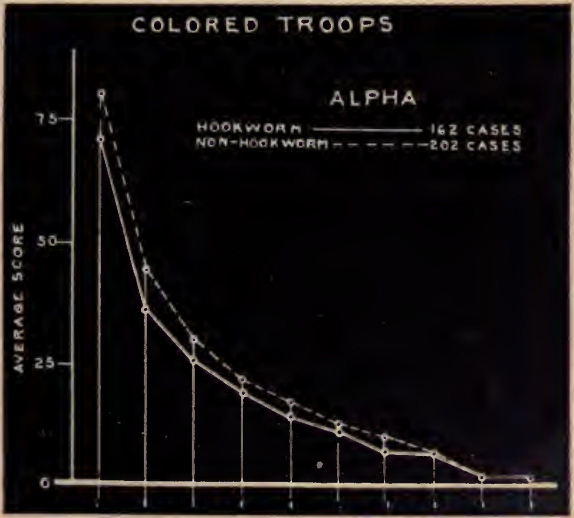

PLATE 20

SUCCESSIVE TEN PER CENT GROUPS

Highest 10% 2nd 10% 3rd 10% 4th 10% 5th 10% 6th 10% 7th 10% 8th 10% 9th 10% Lowest 10%

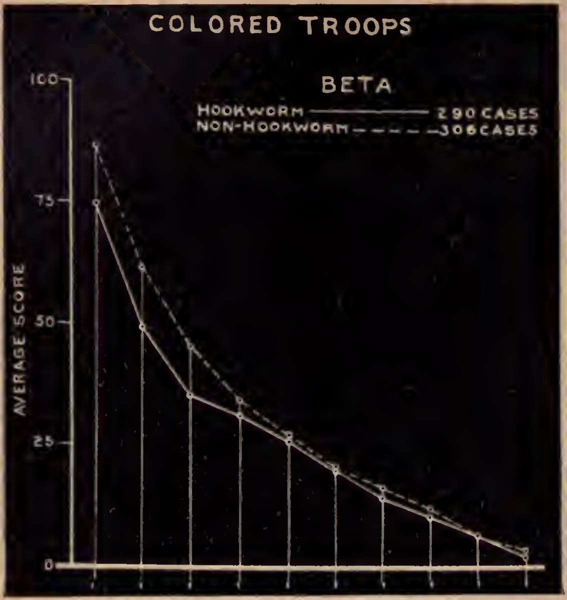

PLATE 21

SUCCESSIVE TEN PER CENT GROUPS

Highest	2nd	3rd	4th	5th	6th	7th	8th	9th	Lowest
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

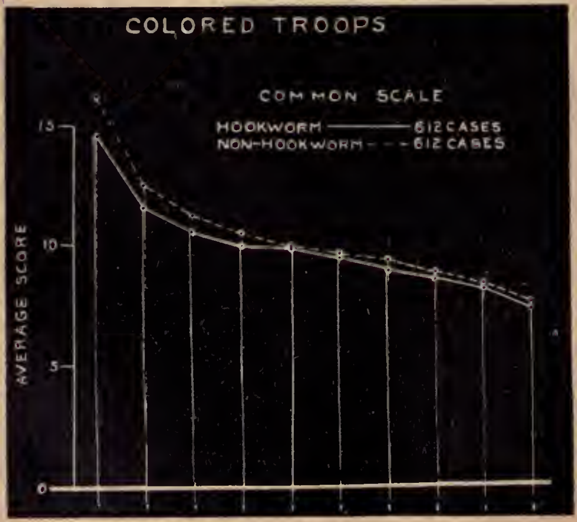

PLATE 22

SUCCESSIVE TEN PER CENT GROUPS

Highest	2nd	3rd	4th	5th	6th	7th	8th	9th	Lowest
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

THE PSYCHOLOGY OF THE THRILL

By Irving R. Kaiser

Perhaps the most impressive fact that one observes in the study of the history of man is the great difference that exists between what were his most primitive modes of conduct and those of the present time. History has revealed to us facts which show that, in his most primitive state, man's conduct was prompted solely by his instincts and that it was largely impulsive in its nature. In fact, his restrictions in doing whatever he wished were governed solely by his physical power and his skill in protecting himself from an enemy and in securing the gratification of his nutritional and his sexual desires; these three comprised what were the main factors of his life. The constant danger that attended his survival caused him to be in more or less of a continual state of heightened excitement of both mind and body. It was only when he was overcome by physical exhaustion that he relaxed his vigilance and sought rest. Judging from their findings in the study of the human body, scientists have come to the conclusion that man led such a mode of existence for many thousands of years, and while perceiving that his bodily development was ideally suited for the life he led, at the same time they have noted that it is not altogether adapted to his present customs of living.

When we come to consider the reasons why the human body is not well adapted to our present customs of daily living, we note that it is due to a marked *contrast* between what were man's former ways of daily life and the ways of life in the present times. Whereas formerly his conduct was prompted solely by his instincts, in our present times it is prompted by precedent and tradition.[1] His impulsiveness of action has been gradually brought under control of a developed will-power; it has been subjected to a certain degree of repression by the individual. In the stead of a freedom of action to do as he wished, his daily activities are now limited to a more or less systematic routine, with which is oftentimes associated a feeling of monotony. His physical activities have in some instances been almost completely supplanted by the use of his brain in the form of his intellectual work, while in other instances they are limited to certain forms of manual labor. Whereas formerly man was forced by his circumstances to acquire a fair degree of skill in many ways, in the present times he has been forced to acquire a high degree of skill in some special form of work. In the past, man was obliged to protect himself from any enemy by means of a bodily encounter, or by the uncertain means of crude implements, such as a bow and arrow; today he is readily able to protect himself in immediate danger by the use of firearms or, in instances of a less immediate character, he may obtain protection by appealing to civil authorities. In addition, here it is against the present day customs for an individual to assault another, this being considered an offense or crime:—this illustrates, in another way, how civilization has restricted man's physical activities. Again, instead of, as formerly, being forced to enter the wilds in search of his food, today he can readily procure it by purchasing it from others. In regard to obtaining the satisfaction of his sexual desires man has been forced to undergo a marked abstinence. Finally, as a result of all these changes which civilization has forced him to undergo, the heightened state of excitement which was so intimately associated with these former activities has likewise been forced to undergo a change. This change, however, like many of those with which it was associated, is one whose nature is more apparent than it is real, its manifestations being inhibited solely by the presence of a constant process of repression going on in the mind. The stress which this process creates in the nervous system acts as a source of constant dissipation of the nervous energy, producing effects which we recognize in the form of a fatigue, a feeling of dullness, irritability, restlessness, or enervation. At times, this condition of dullness, restlessness, etc., becomes so acute that the individual is forced to seek relief by relaxing his repressive processes and indulging in some sort of exciting activity. As Mrs. Walter M. Gallichan has remarked, "There are primitive instincts of tremendous power, which, held in check by our dull and laborious yet sexually-exciting civilization, break out at times in many individuals like a veritable monomania."

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[1] Trotter calls our attention to the fact that, even in our present degree of civilization, man's behavior is seldom guided by "rational" motives, using this term in the strictest sense of its meaning. He says that in most instances man is prompted to act from suggestions, the basis of which are the traditions and precedents of the herd. He mentions that, while the greater part of man's actions are of a non-rational nature, man justifies and maintains them by a process which is termed "rationalization." For a further study of this subject consult his writings.

Again, certain forms of exercise, golf, tennis, fishing, hunting, etc., owe their fascination to the fact that they are activities which, in a way, resemble those of man's more primitive lifetime. The use of alcohol and narcotics also serves to relieve the repressive influences, and, as Trotter expresses it, they afford "a means of securing, for however short a time, some way out of the prison-house of reality back to the Golden Age." Havelock Ellis has gone so far as to say that "even pain may be welcomed on account of the emotional waves it calls up, because it 'lashes into movement the dreary calm of the sea's soul,' and produces that alternation of pain and enjoyment for which Faust longed." In each instance here, whether it be sexual indulgences, various forms of play, the use of alcohol, narcotics, or the undergoing of pain for the sake of its stimulating effects, we are describing means whereby an individual is seeking to attain relief from the effects of this constant repressive action going on in the brain.

Since we are dealing with activities here in which the brain is the central or chief organ concerned, it is best that we first consider in a brief way the requirements of cerebral functioning.

Briefly mentioned, these requirements are oxygen, nutrition, and an abundant circulation of the blood. As long as these are of sufficient quantity and quality, the brain functions normally. Should any of these three factors become altered in the slightest degree, the alteration produces an immediate effect upon the brain. At the present time we lack means of sufficient delicacy to detect the more subtle derangements of function that occur, and the thrill manifestations, with which the present paper deals, are offered as being perhaps the most delicate of those means that we have at the present time. In a general way, however, we may say that all disturbances of cerebral functioning are brought about by the fact that the catabolic processes that occur with cerebral functioning exceed the anabolic processes; the utilization of nervous energy exceeds the power of the elaboration of this force.

Hence, when any portion of the brain is undergoing sustained activity of an intense degree, that portion rapidly becomes fatigued as the result of not being able to maintain a balanced metabolism. We must bear in mind here that each nerve cell within the body functions individually, as regards its specific energy, and that it is necessary that there be a certain amount of stored energy within each cell in order for it to function. It is due to the fact that the nerve cell cannot store energy as fast as it can utilize it that a disturbance in its functions is brought about. It is in this way that we can account for the localized disturbances that occur, as well as the general disturbances. In addition the function of nerve cells may be disturbed by deleterious products of metabolism, created in the body and brought to them in the blood stream.

In the study of metabolism we find the relation of oxygen, nutrition and the circulation to be so intimate that a primary disorder of any one of them produces a secondary disturbance of the other two. Since in the present paper we are dealing with conditions where there is a disorder of metabolism, the subject of normal metabolism will not be considered. For convenience of description the factors of nutrition, circulation, and the oxidative processes will be considered under the general term of "defective systemic oxidation." This term will include not only the consideration of conditions where the disturbance is the result of an excessive oxidation, as in fatigue, but will likewise be used in describing those conditions where the disturbance is due to a diminished oxidation, as in diabetes, the auto-intoxications, etc.

Defective systemic oxidation may vary in its nature from a mild, transient condition following intense mental activity to a pronouncedly developed chronic condition such as we note in epilepsy, diabetes, etc. It is in its mild transient form that we first notice its relation to thrills.

In this form we find it associated with certain mental symptoms of restlessness, dullness, irritability, etc. There is a craving for excitement, a change of some sort, or a sense of dissatisfaction, which I term "thrill craving." By the term "thrill," here, is meant a momentary heightened state of bodily excitement, associated with a marked increase in the blood pressure and an intensely increased circulation of the blood. Physiologically, its purpose is to enhance the systemic oxidation; psychically, its effects are to produce a sense of well-being. The intensity of the thrill is governed by the general bodily tone of the individual. Likewise, whether or not the thrill is associated with a feeling of exhilaration or of strain depends upon the individual's general bodily tone. All thrills must be looked upon as being attempts at physiological adjustment, as attempts towards enhancing an individual's sense of well-being. They may occur as an unconscious process, as a response to a sudden objective stimulus; or they may be consciously and deliberately sought. In those diseases with which a pronouncedly developed defective systemic oxidation is associated thrills may serve as indicators of the individual's condition, as to whether or not he is improving or growing worse.

Although thrills are the manifestation of a single force, vital force, acting in different conditions, for the sake of analysis they may be empirically divided into four elements, as follows:—positive and negative, which pertain to the sensory aspects of thrills; active and passive, which pertain to the motor aspects of them.

If the thrill experienced be accompanied by a feeling of pleasure, we may say that it contains a positive element.

Should the thrill experienced be accompanied with a feeling of stress or pain, we may say that it contains a negative element.

When the thrill is produced by the individual in an active initiated way, it may be said to contain an active element.

Finally, where the thrill is experienced in a passive uninitiated way, we have the presence of a passive element.

Just as we know that in the body every action occurring in the nervous system must have both a sensory and a motor manifestation associated with it, in an analogous way this same factor is true of thrills. Every thrill must have either a positive element associated with an active or a passive one, or a negative element likewise associated. In this way we may say that there are four types of thrills to be found occuring in the body, these being positive active, positive passive, negative active, and negative passive.

However, I wish to mention here that one type of thrill may shade over into another type and that this may be an occurrence that can take place immediately or by a process of graduation, according to the changes that occur in stimulation and the relation of these changes to the individual's general bodily tone at the time of the change. There are no instances where we may witness the presence of one type of thrills as a constant manifestation, though we are able to observe the predominance of a manifestation of one type over that of other types, a fact which is of importance in a diagnostic way.

For example, if an individual's general bodily tone is of sufficient strength to react to a stimulus without strain, we find the individual responding to this stimulus by a positive active thrill. Should the individual's general bodily tone be slightly less than enough to respond with a positive active thrill, we find him manifesting a positive passive thrill. When the individual's general bodily tone is not sufficient to react without great strain, we find him responding with a negative active thrill. Finally, if the individual's general bodily tone be too weak to manifest a negative active thrill, he will respond with a negative passive thrill; which, as we note here, indicates that this last type of thrill is always associated with the weakest degree of general bodily tone. In every instance we must bear in mind that thrills are always to be considered as being attempts at physiological readjustment and that the purpose of this physiological readjustment is, in some instances, to attain a feeling of physiological well-being and in other instances to regain this feeling of physiological well-being when its presence is threatened. Further, we must consider the " ideal of physiological well-being " as representing the guiding principle of not only the intellectual activities of the mind but also of the physiological activities of the system generally.

It is by virtue of the former that we seek *to attain* this ideal of well-being; it is by virtue of the latter that we, in an instinctive way, seek *to regain* this ideal.

When we come to classifying the various forms of human activities in their relation with the four types of thrill manifestations, we find that every form of activity has a more or less distinct relation to one of these four types. All that one has to do in order to recognize which one of the four types of thrills a certain form of activity is a manifestation of, is to analyze the activity in relation to the two elements of which every thrill is composed.

Positive active thrills, as I have shown, are those that are produced by an individual in an active initiated way and afford a sense of pleasure to the individual. Dancing, certain forms of gymnastic exercises, golf, tennis, hunting, fishing, etc., are all instances of activities that afford a means of obtaining positive active thrills. Again, the performance of some artistic form of work, such as music, painting, sculpture, etc., afford a means of obtaining positive active thrills. In recent years modeling in concrete and in clay, structural iron work, basket weaving, and varous forms of handicrafts have been used in some sanatoriums in the treatment of nervous ailments. The beneficial effects that they afford may be attributed to the fact that they are positive active thrill-producing factors. Again, excessive sexual indulgences, masturbation, etc., which are very prevalent manifestations in our present times, may be attributed to the fact that they afford means of positive active thrill production. Finally, the presence of marked sexual excitement in persons who are subjects of tuberculosis and of senile dementia may be accounted for by the fact that it is a ready means of positive active thrill-production. Hartenberg calls our attention to the presence of this same condition of sexual excitement occurring in neurasthenics and mentions that it is sought for the reinvigorating effects that it temporarily produces. It may be considered as merely one form of positive active thrill-producing activity akin to those mentioned in regard to tuberculosis and to senile dementia. Positive active thrills have a predominating "motor" character, and since this feature has a therapeutic value, it is well to bear it in mind.

Positive passive thrills, as have been shown, are those that are produced in an individual by a pleasantly affecting objective stimulus in a passive uninitiated way. Owing to the fact that the individual is acted upon, this type of thrills is associated with less of a sense of effort than is the first mentioned type, and for this reason they are probably the more frequently observed of the two types. The fascination of moving pictures, vaudeville shows, witnessing of ballet dancing or of beautiful works of art, listening to musical concerts or to lectures, etc., is due to the fact that these stimuli produce positive passive thrills in us. While not altogether omitting the importance of hunger in regard to the enjoyment of eating, it may be said that oftentimes the presence of flavor, piquancy, daintiness, etc., serve to produce a distinct positive passive thrill in some persons.

Again, tea, coffee, tobacco, alcohol, and narcotics owe the attractiveness that they hold for some people to their positive passive thrill-producing qualities. The widespread use of perfumes by women is due in no small degree to the fact that they serve to create positive passive thrills. The various forms of gambling that are so commonly witnessed in our present times may readily be seen here to owe their attractiveness largely to the positive passive thrills which they produce. The reading of novels and of many other types of literature is due largely to the fact that they serve to create positive passive thrills. Day-dreaming may be attributed to this same cause. Probably the best indication that beneficial effects are following the use of massage or of hydrotherapeutic treatment is the feeling of a positive passive thrill afterwards. If this is lacking upon the completion of the treatment, it is doubtful that beneficial effects are being derived.

It is advisable to note here that while all the various forms of positive passive thrill-producing stimuli that have been mentioned so far are ones that are usually sought by an individual in order to have some sort of stimulating diversion, there are two forms of activity which, while producing positive passive thrills, are not directly sought by an individual. What are referred to here are abnormal phenomena that occur in epilepsy and in hysteria in the way of convulsions. L. Pierce Clark mentions that, "On careful inquiry one finds not a few epileptics who are not only little concerned about the continuance of attacks, but, if not preceded by an aura with its feeling of oppressive anxiety, they do not particularly dislike having them. Often attacks are desired because they release the individual from the extra nervous tension he feels when a free period longer than usual intervenes. Moreover, in not a few instances one finds epileptics who actually say they take pleasure in having seizures." Havelock Ellis, discussing hysteria, quotes Ashwell as having remarked, "A lady whom I long attended always rejoiced when the fit was over, since it relieved her system generally, and especially her brain, from painful irritation which had existed for several previous days." Upon first thought it might appear that the classification of these convulsive phenomena as positive passive thrills is incongruous, especially since these convulsive phenomena are always found associated with a markedly lowered bodily tone and are most often found to occur subsequent to what the individual feels as an unpleasant stimulus.

Were it not for the fact that convulsions are states of unconsciousness we might readily surmise here that the individual would react with either a negative active or a negative passive thrill under given circumstances. The unconscious nature of a convulsion spares, however, an individual from experiencing these last two mentioned types of thrills, and when he regains consciousness he feels a certain degree of exhilaration or physiological well-being. Therefore, it is this conscious feeling of exhilaration, which follows a convulsive seizure, that has influenced me to classify epileptic and hysterical convulsions as being positive passive thrill-producing phenomena. We must look upon these convulsive phenomena in a way similar to the condition that we find present in individuals under the influence of narcotic drugs. Just as we know that narcotised individuals are capable of experiencing positive passive thrills from stimuli that under other circumstances would be intolerable, in a similar way we may say that a convulsion serves to make itself tolerable and, oftentimes, a desired occurrence, since it affords, like narcotics, a means of enhancing the state of physiological well-being.

In contrast to positive active thrills we note that positive passive thrills show a predominating "sensory" character. Oftentimes, because of this factor, positive passive thrills serve by their stimulating effects to arouse sufficient energy to cause an individual to seek experiencing positive active thrills. A notable example of this is the phenomenon of artistic or of inventive "inspiration." Also, as a result of an increased exhaustion of the nervous system which follows the first exhilarating effects of thrills we may find an individual reacting to a given stimulus with a negative active or a negative passive thrill, depending upon the degree of exhaustion produced. As an example of this, we find a certain degree of irritability following the first exhilarating effects of sexual indulgences.

When we come to consider negative active thrills we find that they are thrills of an unpleasant or painful nature brought about by the presence of stimuli which threaten an individual's sense of well-being, and that the individual seeks to destroy, dispel, frighten or remove in some way this objectionable stimulus. While they may be brought about in otherwise healthy individuals by the presence of a stimulus of too intense a nature, more often this type of thrills is found in those to whom ordinary stimuli have an irritating effect; that is, in individuals whose lowered bodily tone either makes them hypersensitive to stimuli or to whom any attempt at reaction causes a stress within the nervous system. The petulance and the tantrums so often observed in the behavior of weak or neurotic children may be cited as examples of negative active thrills. Worry may be considered as being a very commonly observed form of negative active thrill. Other forms of this type of thrills are observed in tyranny, obstinacy, jealousy, envy, irritability, cruelty, etc.

The mildest form of negative active thrills is probably that of grief. In epilepsy one of the most characteristic features of temperament noticed is the anti-social behavior. In all instances where this anti-social behavior is evidenced, whether in epilepsy or in other neurotic conditions, we may consider it as being so many instances of negative active thrill manifestation, directly attributable to the marked lowered bodily tone present.

Much that figures in the way of acts of vice, criminality, and the like, may be readily interpreted as being instances of negative active thrills of individuals suffering from a condition of markedly lowered bodily tone. In fact, these negative active thrills may be considered as being attributable to this condition of lowered bodily tone more often than as being due to any inherent vicious traits of character. In recent years this fact is coming to receive more and more recognition as a causative factor.

We note in negative active thrills a predominant "motor" character of reaction. In contrast to positive active thrills, they are an activity away from a stimulus instead of towards one. This is in harmony with the ideal of physiological well-being, towards which all activities, both internally and externally, are directed.

Negative passive thrills, which we will now consider, may be said to differ from negative active thrills only in the lack of a manifested activity. This lack of activity may be brought about in two ways. It may be the result of a mental inhibition, or it may be attributed to lack of sufficient general bodily tone. Again, it may be a combination of these two that brings about negative passive thrills. When it is confined to certain forms of activity, either of a mental or a physical nature, the negative passive thrill may be attributed to a localized lowered bodily tone in those parts. Mental inhibition may be looked upon as being a lowered tone of certain involved cells of the brain; just as we know that certain physical inhibitions, such as occur in writer's cramp, are due to the lowered tone of the nerve cells involved in producing movements of certain muscles. Whether it occurs in the physical or the psychic realms, this inhibition may be looked upon as being the effects of a similar affection of nerve cells.

This condition of lowered bodily tone, whether general or local in nature, varies from time to time. Moreover, there may exist different degrees of lowered tone in different portions of the body at the same time.

In normal individuals we may find negative passive thrills occurring in the form of acts of embarrassment, bashfulness, timidity, etc., when they are in the presence of a stimulus producing an overly intense effect upon them. In abnormal conditions they may be brought about by ordinary stimuli acting upon a hypersensitive organism, the hypersensitive condition of the organism being due to a lowered bodily tone. It is in this way that the occurrence of certain hysterical phenomena, such as contractures, paralyses, etc., may be accounted for. They are analogous, in a physical way, to the psychic phenomena which we observe in certain forms of behavior, such as obstinacy, apathy, reticence, etc., all depending upon the effects of stimuli upon a hypersensitive nervous system. The lamentations of individuals suffering from melancholia, the hypochondriacal attitudes of mind noted in neurasthenia, and the petulance that is found to be so commonly present in diabetes, may be looked upon as forms of behavior indicative of negative passive thrills. Often times the sexual frigidity occurring in women may be looked upon as being a negative passive thrill manifestation. This last-mentioned phenomenon bears a close resemblance in its nature to hysterical anaesthesia.

In defining thrills in a previous portion of this paper it was mentioned that they were momentary heightened states of bodily excitement, etc. Under certain conditions, thrills may be observed to manifest themselves over a long period of time.

We may consider what is ordinarily spoken of as "delirium" as being a manifestation of a thrill extended over a long period of time. The phenomenon of delirium is always found associated with a markedly defective systemic oxidation which especially affects the brain. The reasons for this defective systemic oxidation having a selective effect here, I will not attempt to offer any explanation of in the present paper. Usually the type of thrill which the delirium manifests is a negative active, as in mania or in dementia praecox. Occasionally, a positive active or a positive passive thrill is evidenced, as in hysteria.

Sometimes a stimulus, when it is of great intensity, will produce a shock or syncope before it can be recognized in the consciousness. However, in those instances where a stimulus is recognized before unconsciousness occurs, it is felt as an intense negative passive thrill of horror.

In order to understand the relation of thrills to emotions it is necessary that we first discuss the relation of thrills to instincts. Just as Havelock Ellis considers that touch is the "sense which is the most ancient and fundamental of all—the mother of the other senses," in an analogous way thrills may be considered as being the most ancient and fundamental of all instincts—the mother of the other instincts. Thrills are closely bound up with the sense of irritability, on the one side, and with the sense of movement on the other; it is an intermediate process occurring between these two phenomena, a sort of nascent activity. Given a certain stimulus by way of an irritability, we may look upon the thrill as being the heightened state of excitement that follows; and here no reference is intended to movements of voluntary musculature but to the internal changes that occur prior to observable movement in the form of instinctive activity. In other words, the particular forms of instinctive activities are all merely expressions of this state of preceding excitement, an excitement of the involuntary nervous system. The instincts may be looked upon as being acquired modes of expression of this excitement. Again, Ribot has expressed the opinion that this excitement of the involuntary nervous system depends "not only on physiological conditions, but still more intimately on the chemical action going on in the tissues and fluids of the organism." McDougall states: "It is probable that every organ in the body exerts in this indirect way some influences upon the mental life, and that temperament is in a large measure the balance or resultant of all these many contributory chemical influences." Freud, in discussing nervous diseases, mentions: "We can hardly avoid perceiving these processes as being, in the last analysis, chemical in their nature." The researches of Crile and of Cannon have, in recent years, tended to confirm this theory of chemical influences. In fact it is to this chemical influence that the sense of physiological well-being with its associated phenomena of thrill-craving and of thrill-expression may be attributed. Any alteration of the chemical status of the body has an immediate effect upon the sense of physiological well-being. This leads to the creation of thrill-cravings, which in turn bring about states of excitement that are the forerunners of thrill-expression.

Having shown that thrill force is a common component of all instinctive reactions, we will now proceed with the discussion of instincts. McDougall, describing instincts, says: "We may say, then, that directly or indirectly the instincts are the prime movers of all human activity; by the conative or impulsive force of some instinct (or of some habit derived from an instinct) every train of thought, however cold and passionless it may seem, is borne along towards its end, and every bodily activity is initiated and sustained. The instinctive impulses determine the end of all activities and supply the driving power by which all mental activities are sustained, and all complex intellectual apparatus of the most highly developed mind is but a means towards these ends, is but the instrument by which these impulses seek their satisfaction while pleasure and pain do but serve to guide them in their choice of means." While admitting that pleasure and pain serve as guides to instinctive activity, their rôle in the instinctive activities is not limited to this function alone. Not only do pleasure and pain serve to guide the instinctive activities but they accompany them throughout their course of action. As McDougall further remarks: "We seem justified in believing that the continued obstruction of instinctive striving is always accompanied by painful feeling, its successful progress towards its end by pleasurable feeling, and the achievement of its end by a pleasurable sense of satisfaction." We may presume, here, that McDougall has reference to the expression of instinctive striving being inhibited by a process of mental repression. In accordance with the thrill theory, however, these instinctive activities may have an accompanying feeling of pleasure or of pain the origin of which is due to the condition of the general bodily tone. As have been shown, if an individual's general bodily tone is sufficient, he may respond to a stimulus by a positive passive thrill; if his general bodily tone is low, this same stimulus, by the stress it causes in the system, will cause the individual to respond with a negative active or a negative passive thrill. Here we have the pleasurable or the painful feeling depending upon the initial strength of the individual's system and not due to an obstruction of any sort. As Marshall has said, "The activity of an organ of any content if efficient is pleasureable; if inefficient is painful."

If we take our theory a step further we will find that thrills are not only component parts of all instinctive activities but that they are the chief component parts; the parts that constitute the force, of which the instincts are but various forms of manifestation in a motor way. In addition to these instincts, or motor manifestations of this force, we have certain sensory manifestations, these sensory manifestations arising from the feelings of stress produced in the various internal organs in response to a particular stimulus.

What have been termed the "emotions" may be considered as being these sensory components of thrills. Therefore, we may say that the instincts do not cause the emotions nor do the emotions cause the instincts, but that both are merely concurrent phenomena which are manifestations of a common origin, the thrill force. As Marshall says: "We should not speak of the expression of the emotions, nor of emotions as caused by the expressive activities, but of the emotions as the psychic side of these expressions, using this last term broadly." The emotions are merely the psychic translation of the sensory component of the thrill, the awareness of this component in the psychic realms, as distinguished from the physiological realms in which it arises.

Leaving the discussion of the relation of emotions to psychic activities for a few moments, let us take up the consideration of emotions in their relation to organic activities, returning to the former consideration later. Professor Angelo Mosso says: "We are sometimes surprised by a sad or a joyful piece of news. We all know what happens in a state of fear and distress. Physiological phenomena occur that cannot be described. But when we learn suddenly that the news which has troubled us is false, that our fear and distress had no foundation, the internal disturbance does not cease, the physiological phenomena continue in the organism in spite of all efforts of the will to suppress them.

"The investigation of these processes has shown that the seat of the emotions lies in the sympathetic nervous system.

"Before we were born, and for a long time after birth, our life was entrusted to the activity of the sympathetic system and the reflex movements derived from the spinal cord.

"In decisive moments of life, when emotions are most violent, it is just the sympathetic nervous system that comes into action. The intestines and the smooth muscular fibers contract in order to raise the pressure of the blood and to utilize the blood better for the brain and the muscles.

"The organs of the abdomen and the pelvic cavity are just as sensitive to the emotions as the heart. I have studied the movements of the abdominal organs, the stomach, and the rectum. In the smallest emotions movements of the intestines and stomach always occur.

"The preponderating activity of the sympathetic system in the emotions is so great that the brain effort is not able to suppress it. Many men feel a contraction of the abdomen when they look down from a tower or other high place. These troublesome sensations which are connected with the idea of a possible fall are simply caused by the contraction of the bladder and the intestines.

"We understand now that the constant and fundamental movements taking place in emotions are the movements of the internal organs of vegetative life.

"In order to increase the circulation of the blood in the brain and muscles our bodily machine has to work under a higher blood pressure. This end could be attained only through the sympathetic system, which sends its fibers everywhere to the smooth musculature. During blushing a paling of the skin can be noticed before the blood-vessels expand and the blush proper takes place.

"Whatever the emotions may be, we always see that in these states the blood pressure increases, the heart beats become stronger, and the respiration deeper. These advantageous effects are the same in man as in animals, when they fix the attention, are passionately excited, curious or jealous, or when they run at play or in pursuit of prey."

As we note from the above, Mosso's description of the emotions bears a great resemblance to what has been described as constituting thrill factors. However, in the present paper, emotions are not considered as being the result of these excitations of the sympathetic nervous system, these last being considered as thrill causing factors. It is the sensory feelings associated with these excitations, the feeling of stress set up in the organism, in response to a stimulus, that constitutes the emotion. The actual force that is elaborated in response to a given stimulus we may consider as being used in the muscular activities which we term the "instincts" and in the mental activities of the moment. Further, we may say that all thrills are the same in nature, differing only as to the intensity of the thrill force and the stress created in the nervous system in providing it. If the force is of sufficient intensity it will cause one form of instinctive behavior; if of another intensity, it will cause a different form of instinctive behavior to occur. An individual may run away from an assailant in the case of the first instance; he may remain and strike in the case of the second instance. Again, if the thrill force is produced without much stress, it will cause one form of emotion to be felt; if it is produced only as the result of much stress, it will cause a different form of emotion to be felt. In the case of the first, a certain stimulus may cause an individual to feel joyous; in the case of the second, it might cause the individual to feel angry. Besides these extremes of manifestations of thrill activities there are a vast number of intermediate forms of instincts and of emotions that may be evidenced in response to a given stimulus.

Various observers have noticed the similarity of organic activities that produce what I have termed the "thrill," and which includes both instinctive as well as emotional factors. As Mosso remarks, "Even a practiced observer is often unable to decide from the gestures and facial expression of an individual whether he is enraged or in a state of greatest joy. . . . Indeed, in great pain and great pleasure we have the same phenomena—trembling of the muscles, secretion of tears, expansion of the pupils, decrease of visual acuity, buzzing in the ears, oppression of the breathing, palpitation of the heart, inability to speak, exclamations, convulsive movements of the diaphragm, etc." He also calls to our notice that attention and muscular exercise produce the same chemical effects and the same fatigue, which shows this sameness of mental and of physical activity in another way, both of which we may look upon as being forms of thrill manifestation. Woodworth mentions that "Cannon calls attention to the fact that the bodily changes in fear and anger are the same, though the emotions are different, and infers that the emotion cannot be wholly a reflection of the bodily state. The bodily state which he has discovered might, indeed, be better correlated with the more generic conscious state of *excitement,* which Wundt has put forward as one of the elementary feelings. Probably this bodily state occurs when the emotion is not strictly either fear or anger. Cannon finds evidence of it in athletes before and during a contest, and in students during an examination, though the conscious state in these cases is probably not exactly either fear or rage; it would be better named zeal, determination, or excitement. Yet it is not at all improbable that minor differences in the bodily condition exist corresponding to these differences in the emotional state, so that the body is not quite the same in fear as in anger." Woodworth also calls our attention to the similarity of physical phenomena occurring in willing and in anger. In his discussion of "Love and Pain," Havelock Ellis remarks, "Moreover we have to bear in mind the fact—a very significant fact from more than one point of view—that the normal manifestations of a woman's sexual pleasure are exceedingly like those of pain." "The outward expressions of pain," as a lady very truly writes,—"tears, cries, etc.,—which are laid stress on to prove the cruelty of the person who inflicts it, are not so different from those of a woman in the ecstasy of passion, when she implores the man to desist, though that is really the last thing she desires." Ellis also reminds us that, "De Sade has already made the same remark, while Duchenne, of Boulogne, pointed out that the facial expressions of sexual passion and of cruelty are similar." . . . As Krafft-Ebbing remarks, both love and anger "seek their object, try to possess themselves of it, and naturally exhaust themselves in a physical effect on it; both throw the psychomotor sphere into the most intense excitement, and by means of this excitement reach their normal expression." Marshall, discussing the emotions of joy, sorrow, dread and relief, says that they "appear to be coincidents of increase or decrease of general systemic activities; in a very broad sense, therefore, they may be looked upon as different phases of one emotion." He remarks, in discussing the physical basis of emotions in general, that he does not think "it is at all possible to limit the physical activities involved with the emotions to such effects of voluntary innervation or alteration of size of blood-vessels or spasm of organic muscle as Lange seems to think determine them; nor to increase and decrease of muscle power as Fere's results might suggest; nor to such changes, in relation of size and capillaries, in voluntary innervation, in respiratory and heart functioning as Lehmann has observed. . . . For these emotions seem to me to be coincidents of reactions of the whole organism tending to certain results." Marshall's views here are in thorough accord with what has been described regarding thrill phenomena in the present paper—thrills, as have been shown, being responses of the whole organism to a stimulus, and the different emotions merely sensory phenomena of the thrill, and, as has been shown, indicate different degrees of stress of the organism in adjustment or the production of the thrill force.

Having investigated the relation that organic processes have to emotional phenomena, our next consideration will be the discussion of the James-Lange theory of the emotions in regard to our findings.

In defining emotions, James has written: "The bodily changes follow directly the perception of the exciting fact, and our feeling of the same changes as they occur in the emotion. Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry or fearful, as the case may be." While agreeing with James that the bodily manifestations must first be interposed between the perception, or stimulus, and the final reaction or manifestation, at the same time it is difficult to accept this hypothesis that we feel sorry *because* we cry; angry *because* we strike; and afraid *because* we tremble. According to the thrill hypothesis we may say that we feel sorry *and* cry or we cry *and* feel sorry; are angry *and* strike or strike *and* are angry; are afraid *and* tremble or tremble *and* are afraid. It makes no difference as to which way we express the phenomena here, because neither the sorrow, anger or fear cause the crying, striking or trembling; nor does the crying, striking or trembling cause the sorrow, anger or fear, as the case may be. In no instance does the one factor cause the other; they are merely coincidently occurring manifestations and are both associated with a common cause, the thrill. As has been shown, the emotions are the sensory component of thrills, while the instincts are the motor component of them. The emotions are related to the varying degrees of stress caused in the organism when it initiates the thrill force, while the instincts are the expression of this thrill force in a motor way. In all events we have but one type of general organic activity occurring, regardless of the emotion or of the instinct manifested. Also, the instinct is not in any way directly related to the emotion. This last may be clearly illustrated in the following four examples: (1) If we have a thrill of a marked degree of intensity, readily produced in the organism without a stress, we will have a certain form of instinct manifested and a certain emotion, each depending upon their respective causative factors. (2) If the thrill is not of a marked degree of intensity but readily produced without stress, we will have a different instinct manifested, while we may have the same emotion produced as in example one. (3) If the thrill is of a marked degree of intensity, but only produced as the result of much stress, we may have a similar instinct occurring here as in one, while we would have a different emotion manifested. (4) If the thrill was of a low degree of intensity and produced only by much stress, we would have an instinct and an emotion occurring that were different from any in the three previously mentioned examples. If the degree of stress produced in the organism is not too great we may find manifested merely a difference in degree of the same type of emotion: as from joy to elation to ecstasy; irritation to anger to rage; dread to anxiety to fear; or, surprise to astonishment to amazement. Here we have a variation of the same type of emotion, the difference being only one of degree of intensity. However, if the degree of stress is very marked, we will more likely have a complete change in the type of emotion to occur, as a change from love to anger; fear to grief; sorrow to love, etc. What has been said here in regard to the emotions may be applied likewise to the instincts, in regard to variations in the degree of intensity or volume of the thrill force, in its relation to motor and intellectual manifestations.

Passing now from the more elementary forms of mental activity to those higher forms which we recognize under the general term of "intellectual processes," we find that the change is not marked by any abrupt differences, but on the contrary is one that is gradual in its nature, that it is an evolutionary progression in mental development. In fact, we note these lower forms of mental activity being constantly present and forming the essential parts of all these higher forms of mental activity.

As a process which forms a connecting psychic link between those external factors, in the way of various stimuli, and the various internal factors, in the way of emotions and instincts, we have the process of "attention." It is to this process of attention that we must attribute the development of all the higher forms of intellectual activity as we know them. Hence it is necessary that we consider in detail the nature of this process and the various forms of manifestation which it exhibits.

In its most elementary form we may say that attention is merely the awareness of certain external or internal stimuli without any necessary cognition on the part of the organism as to its exact nature. Further, we may say that it is at first purely a passive factor, a process secondary to an exciting stimulus of some sort and of a reflex-action nature. Its association with a certain degree of motor response in the form of muscular tension has been noted by many investigators. As James says, " Movement is the natural immediate effect of feeling, irrespective of what the quality of the feeling may be. It is so in reflex action, it is so in emotion, it is so in voluntary life." Again, G. Stanley Hall remarks, " Truly spontaneous attention is conditioned by spontaneous muscle tension." Mosso states, " Attention produces not only the same chemical effects and the same fatigue as muscular exertion does, but we feel also, when we are attentive to anything, the characteristic muscular strain on the occiput, the forehead, and other parts of the body." He also mentions, " the intelligence, the sensitiveness, and the movement are phenomena which cannot be separated from each other, that their fusion and their connection belong to the same conditions which permit us to comprehend the nature of the mind." It is attention of this passive variety that Ribot has termed " spontaneous," James " passive," " reflex," " involuntary," or " effortless," Arnold " primitive," or " instinctive," etc. In order to obtain a clearer order of description of the several varieties of attention for the purpose of our discussion, we might term this first variety that we are considering, " passive objective attention ; " " passive " here referring to the secondary nature that the individual has to the particular stimulus, and objective, to the external source of stimulus involved.

In this form or variety of attention we are considering it as being a reaction to some sort of intense stimulus—a bright color, loud sound, strong odor, or the awareness of an intense feeling of heat, cold, etc. It is the earliest variety of attention that an individual experiences and is in no way associated with any sense of interest but is merely felt as either a pleasureable or a painful experience. It in no way is associated with cognitive factors and is transitory or vague in this earliest form. In fact, it is only after repeated experiences of a particular stimulus that it finally becomes a definitely recognized factor. When this is beginning to take place, we may say that the individual is experiencing that second variety of attention which we will call " passive subjective attention " or attention in which the individual, while aware of the objective nature of the particular stimulus, has an internal or subjective sense of recognition. Again, although this variety of attention is associated with the development of a definite recognition of objective stimuli, this process of recognition is one that is very gradual in its nature. It is intimately associated with two other factors, that of memory, and, later, an association of ideas. For this reason we will take up the discussion of this last-mentioned two before proceeding to discuss it further.

In discussing memory, Meumann writes, "Every mental process must have a certain minimal duration in consciousness if it is to establish a disposition to revival.' . . . "Every mental process must recur to consciousness a certain number of times if security of attention is to be retained." . . . "The rhythmic recurrence of impressions and ideas tends to reinforce their retention." Also, "Every experience which was attended by more or less intensive feeling or emotion . . ." becomes endowed with a greater tendency to revival.

We can see here that, in time, after an individual has acquired a store of experiences, he will gradually learn to discriminate between the various ones and that, likewise, those experiences which were unusually intense in their nature or those which were experienced more often than others will have a tendency to revival more readily. It is this acquired power of discrimination that makes possible what we term the "association of ideas."

We can readily note here that an individual's particular manner of association of ideas is directly related to his peculiar physical conditions and his environment. An individual whose general bodily tone is of high order would naturally associate a given experience in a different way from one whose general bodily tone is less pronouncedly strong. Again, social differences, age, sex, etc., may serve to account for a difference here. As Meumann says, "What particular idea shall appear in consciousness in any particular case is a matter which is not determined solely by the associative connections possessed by the ideas which are present at the moment; quite as much influence is exerted by the general condition of the individual, his freshness or fatigue, the fact that he is well-disposed or ill-disposed, the total group of impressions and ideas which are clearly or obscurely present to his consciousness, his feelings, and everything else that may be designated as his conscious constellation." These, as we shall now see, determine the choice of an individual's interests. As Arnold reminds us, "In the more advanced stages of development, interest and attention run together, but as first attention is somewhat in the lead. Conditions other than interest are able to impel attention. Thus, intensity of impression and feelings of pleasure-pain can excite primary or instinctive attention. Interest is not then in evidence. But if such instinctive attention results in pleasure, ease, satisfaction, and the like, it lays a basis of interest in such a situation.

"When the situation is again present there will be felt a tendency to go through the process which resulted in the former feelings of pleasure or satisfaction. In more advanced stages, the interest and the attention are concomitant. Interest is then the impelling aspect, and attention the controlling."

It is to these passive objective, and, later, passive subjective varieties of attention, to the various experiences that an individual has felt as being either pleasureable or painful that we must look for the reasons of his individual interests, with their subsequent influence upon his later active forms or varieties of attention. It is to these that we must look for the understanding of why certain stimuli, both subjective and objective, cause an individual to express his thrills in a particular way; why a given stimulus causes an individual to have one type of thrill while the same stimulus has an altogether different effect upon another individual, and why two individuals express the same type of thrills in different modes of activity or behavior. The relation of interest to thrills here is: It is not so much a matter of stimulation, solely, but the combined effects of stimulation plus certain internal factors in the way of general bodily tone, physically, and the association of ideas, mentally, that determine the interest, attention, and the thrill. As James says, "The natural way of conceiving all this is under the symbolic form of a brain-cell played upon from two directions. Whilst the object excites it from without, the other brain-cells arouse it from within. The plenary energy of the brain-cell demands the co-operation of both factors; not when merely present, but when both present and inwardly imagined is the object fully attended to and perceived." Finally, in regard to passive subjective attention, we must bear in mind that it may be brought about by the spontaneous revival in the mind of certain memory images, without any direct relation to an objective stimulus. We note an example of this in what we call "day dreams" and in those fleeting thoughts that come to our mind from time to time.

When we come to consider the difference between the two passive varieties of attention, which we have been discussing, and those two active varieties, which we are about to discuss, we find that it is due largely to the added factor of interest in the latter. Whereas in the passive varieties an individual attends in more or less of a reflex way to certain stimuli, in the active varieties he purposely, or consciously, makes an effort to attend; that is, he is impelled by particular interests to attend. This variety of attention has been termed "voluntary," "secondary," "active," "sustained," etc. In the present paper we shall divide it into two varieties, which correspond to the two general ways in which it is observed—"active objective" and "active subjective" attention. Since active objective is the first of the two varieties of attention to appear, we will discuss it first.

As Compayre remarks, "Charm, interest, is the great source of attention." It is this charm or interest that not only determines the particular choice of what we shall attend, but it likewise serves to sustain our attention after the choice has been made. Remove the interest and an individual ceases to be actively attentive. Ostermann says that it is the interest that causes the maintenance of voluntary attention and that all interests depend entirely on the feelings of like and dislike, of pleasure and displeasure. Arnold, expressing the same opinion but in other words, says, "Interest impels effort. In that an individual is before a situation which will, when properly controlled, lead to a state of pleasure, ease, and the like, effort will be put forth. There need be no immediate pleasure or satisfaction in such control so long as the final realization is more or less pleasureable and satisfying. If the terminus is more painful than the present situation, effort will likewise be shown, so long as such effort leads from the repelling situation. . . . Effort is nothing more than the subjective and felt aspect of motor control in the process of attention." Again Munsterberg remarks, "Effort is truly nothing but the working of auto-suggestion" and "The chief motive of human actions lies in feelings and emotions." In all the remarks cited we note that what impels an individual to actively attend to a given situation is the interest that this situation has for him; it is the interest that causes him to put forth the necessary effort required. It is not true that this interest is unvarying in its constancy toward a given stimulus. On the contrary, it varies with the individual's feelings, with his general bodily tone, and is seldom of the same degree of intensity for a given stimulus, tending to lose its force with the passing of time. It is not so much any single factor that maintains interest in a given situation as it is the presence of several factors which are associated; we can readily note this in the fatigue that readily ensues upon attention to monotonous excitation of any sort. We may attribute this last-mentioned fact to an exhaustion of certain groups of nerve-cells involved. So long as a different series of nerve-cells are aroused from time to time in relation to a given situation, so long as a given situation serves to stimulate in different ways, we may have present a sustained interest with its associated process of attention.

All that we have been discussing in relation to active objective attention have been instances where the individual was actively attending, because of some interest, some objective stimulus. In discussing this variety of attention we must bear in mind that it is supposed here to represent an activity that occurs only in response to an immediately present stimulus and is not related in any way to purely abstract concepts or subjective ideas in general.

We might, for example, say that it is the kind of attention that we will find present where one is interested in some game, such as golf, tennis, etc., which loses its intensity upon the cessation of the particular activity.

As the last and the highest form of attention we find developing in an individual, we have "active subjective" attention. In this variety we find an individual whose interest impels his attention not to external or objective stimuli but to inner, subjective ones. The form of stimuli here may be abstract conceptions in a way of solving mathematical problems, the composition of music or of poetry, etc., the invention of devices of various sorts, or the study of problems in science. Again, the various phenomena which we group generally under the title of "unconscious cerebration," those activities which go on in the lower levels of consciousness in the form of attitudes of behavior, personal convictions, etc., may be included here as being matters of active subjective attention of a less intense degree than those which have been previously mentioned.

It must be remembered here that while we have divided attention into four fairly distinct varieties this has been solely for the purposes of description. Just as was said when discussing thrills, that they are all forms of manifestation of a single phenomenon, the same may be said in regard to attention; it is of one character only but it manifests itself in various ways, as has been shown. Again, just as we noticed in regard to thrills that certain types of them are found associated with one condition of general bodily tone, while other types are always found associated with another condition—a lower degree of general bodily tone, for example—we likewise have a similar condition of affairs occurring in regard to the variety of attention that an individual manifests. We may say here, in a general way, that an individual is inclined to manifest a tendency towards a subjective form of attention in illness, in the form of introspection, for example; while in health he is inclined to manifest a tendency to the objective forms, less so to the subjective. As to which variety of attention he manifests most often, this depends partly upon his environmental demands and partly on his general bodily tone;

both of these must be taken into consideration from the standpoint of the particular individual since no two persons can be judged from a general standard. We may postulate it as a general law that as the general bodily tone becomes lessened, the interest becomes lessened in proportion. Hence, we find a certain parallel between certain degrees in the intensity of interest and certain types of thrills. For example, we find interest and attention most pronounced in positive active thrills and least pronounced in negative passive thrills, the other types of thrills showing intermediate degrees of attention and interest. This is because both interest and thrills depend upon the condition of the general bodily tone. We might say here that the interest directs the expression of the thrill when it passes from the physiological into the psychic realms; it determines what form of activity the thrill shall be expressed in, and since it varies from moment to moment with the general bodily tone, the expression of the thrill likewise varies. By the word "directs," I mean that it determines in a passive way, since interest is merely a term which may be said to indicate the viability of the nerve tracts involved in certain situations. If the passage of impulses is inhibited for any reason, whether this is due to fatigue, previous unpleasant experiences with a given stimulus, lack of intensity, etc., we shall have a lack of interest present. As Clàparede remarks in regard to interest, "Suitable choice ('choix adapte' i. e. a decision that harmonises with the wellbeing of the organism) is a process of the reflex-action type. It is not some mysterious power that chooses, but it is the want and the object combined which together effect the selection of the reaction most appropriate to the organism." In conclusion we may say that "the immediate effects of attention" (and interest) "are to make us: (a) perceive; (b) conceive; (c) distinguish; (d) remember; and that attention "shortens reaction-time." (James.)

After attention, habit! In fact, we may say that one may acquire habits of attention. However, in this case, as in all others, we may consider the habit as being the result; the attention, the cause. While at first, during the period when attention is most in evidence, the acquirement of the details of a mode of action are difficult, later these factors become easier of conception. As Dr. Carpenter says, "Our nervous system grows to the modes in which it has been exercised." In discussing the immediate effects of attention a moment ago, we noted that it shortened the reaction-time of an individual to a given stimulus. The relation that this shortened reaction-time has to habit-formation will be readily perceived in what James has mentioned as being the effects of habit. He mentions that, " Habit simplifies the movements required to achieve a given result, makes them more accurate and diminishes fatigue " and that, " Habit diminishes the conscious attention with which our acts are performed." It is a question whether we should say here that " habit simplifies the movement, etc.," and " habit diminishes the conscious attention, etc.," unless we conceive habit to be the actions with which we are concerned here. If we consider the actions to be one thing and the habit another, it seems better to say that the habit is the result of these repeated activities and, therefore, that these last do these things which James mentions habit as doing. In this case we may more properly attribute the results as being due to repeated movements performed during an intense state of attention and say that it is the combined result of these two which accounts for these changes. We would then say that habit was the final result of this process; that these changes mark the presence of a formed habit, and not that habit itself is responsible for these changes in any way. In this way we may say that habit is not only an acquired phenomenon but that it is a passive or end product, the completed mode of action. As James remarks of the Duke of Wellington having said, " Habit is second nature! Habit is ten times second nature," we may, accordingly, say that habit is second nature, and that it is not a habit unless it is second nature. Therefore it does not do anything but merely marks the completion of something that has been done. If it seems that undue stress has been placed here in distinguishing the exact conception of habit as a passive rather than an active phenomenon, it is because it is necessary that we have a very clear idea of what habit is in order to properly understand its relation to thrills. Perhaps the most characteristic feature of thrills is the fact that they readily lead to a habit formation. For this reason it is advisable that we consider the formation of habits in a more exact way than we have in the foregoing.

In order to obtain an exact conception of what takes place in the formation of habits, it is necessary that we consider what are the organic activities that occur during the process of their formation.

As Munsterberg says, " What else can be the brain's function in the midst of nature than the transforming of impressions into expressions, stimuli into actions? It is the great apparatus by which the organism steadily adjusts itself to the surroundings. There would be no use whatever biologically in a brain which had connections with the sense organs, but which had no connections with the muscular system; and on the other hand, a brain which had motor nerves and muscular adjustment would be entirely useless if it had not sensory nerves and sense organs connected with it. In the one case the world would be experienced but no response would be possible; in the other case, the means of response would be given but no adjustment could set in because no experience of the surroundings would be possible. Adjustment every moment demands the relation of the brain in both directions. Through the sensory nerves the brain receives; through the motor nerves the brain directs, and this whole arc from the sense organs through the sensory nerves, through the brain, through the motor nerves and finally to the muscles, is one unified apparatus of which no part can be thought away. The brain in itself would be just as useless for the organism as the heart would be without the arteries and veins. We must keep this intimate and necessary relation between the sensory and motor parts constantly in view, and must understand that there cannot be any sensory process which does not go over into motor response."

Again, as James remarks, " The currents, once in, must find a way out. In getting out they leave their traces in the paths which they take. The only thing they can do, in short, is to deepen old paths or to make new ones; and the whole plasticity of the brain sums itself up in two words when we call it an organ in which currents pouring in from the sense-organs make with extreme facility paths which do not easily disappear." In the foregoing we note that there is always involved, in every mental activity, both a sensory and a motor part. The question that naturally arises here is: what happens when we receive a given stimulus and do not act? In answering this we might say that the lack of response is due to the fact that the stimulus was too feeble to arouse our attention. Again, we might say that the lack of response is due to an act of deliberation on our part; that instead of the sensory impulse received passing over into a concrete act, it was dissipated or utilized in arousing other brain-cells in the way of establishing an extended association of ideas, and that part of the impulse was used to inhibit muscular activity; this last being manifested in a tension of the muscles affected. However well such an answer may serve to explain the question, it lacks much in the way of being exact. So, in order to obtain a more exact conception of what is involved here, let us consider the problem from the standpoint of recent discoveries that have been made in regard to habit formation and its allied factors.

We noted, when quoting Munsterberg and James, that every nervous activity, whether it be a simple physical reflex action or a conscious mental process, involved the use of both sensory and motor nerves. We speak of this intimately associated relationship of these nerves as a "sensori-motor arc," and in addition we have learned that all impulses pass through this arc but in one direction, from the sensory to the motor nerve. This has been termed the "law of forward motion." In the simple reflex actions, where the process is not under conscious control, we can note the presence of these sensori-motor arc very readily. Given a sensory stimulus, we observe an immediate motor response. However, when we come to the consideration of what we term "consciously willed acts," we note that the immediacy of response between a sensory stimulus and a motor reaction is oftentimes delayed or lacking. Therefore, we know that there must be a process of some sort that serves to block, to control, the passage of impulses from a sensory nerve to a motor nerve and that this process comes into action in varying degrees from time to time. As Eliott Park Frost remarks, "now this exquisite function apears to be performed in human nervous systems by a microscopic mechanism found in every sensori-motor arc. Its discovery has been only recent. The name given it is "synapse."

Further, "It has been proved that in the nerve proper an impulse can pass in either direction, while on the contrary just as soon as a synapse is crossed the nervous process becomes irreversible. Synapses act like trap-doors, allowing nerve currents to pass in one direction only. Still again, experiment has established the fact that these "trap-doors" will not open when a weak impulse presents itself, but will dam back the energy in such an impulse, resisting it until several such feeble currents have been summed together. This resistance is then broken down by the collective energies, thereby accomplishing what one or two impulses alone could not do; that is, move the muscle." This last is what James has termed the "law of the summation of stimuli." We now see why a given sensory stimulus may, within limits, not pass over into an immediate motor response. As Ribot remarks, "We can classify ideals roughly into three groups, according as their tendency to transform themselves into action is strong, moderate, or weak and even, in a certain sense, null.

1) The first group includes extremely intense intellectual states, of which fixed ideas may serve as a type. They pass into action with a fatality and rapidity almost equal to those of reflexes. These are the ideas which "take hold of us."

2) The second group is the most important for us. It rep-

resents the rational activity, the will in the usual sense of the word. The conception is followed by an act after a short or long deliberation.

3) In abstract ideas, the tendency to movement is at its minimum. Their motor tendency is reduced to that interior utterance, slight as it may be, which accompanies them, or to the awakening of some other state of consciousness. For just as in physiology the centrifugal period of a reflex does not always end in a movement but as likely in the secretion of a gland or a trophic action; in the same way, in psychology, a state of consciousness ends not always in a movement but in the resurrection of other states of consciousness according to the well-known mechanism of association."

In regard to habit formation and habit reformation this phenomenon of synaptic action has a twofold importance. In order to establish the formation of a habit it is necessary that the sensory impulse be reacted in a motor way before we can have any effects produced. As James says, " It is not in the moment of their forming, but in the moment of their producing motor effects, that resolves and aspirations communicate the new ' set ' to the brain." Also that we must take care to " launch ourselves with as strong and decided an initiative as possible; " the importance of this being due to overcoming the resistance of the synapses, which we have previously mentioned.

Finally, in overcoming the bad habits we must bear in mind the fact that once a habit is formed, a given stimulus tends to go over immediately into a motor reaction. As Elliott Park Frost remarks, " We know that consciousness is motor, that the things of which we think are bound to get into action unless prevented by some other action. . . . All acts are the direct result of ideas that, for the moment at least, are free and unchecked by contrary ideas." Just what decides what set of ideas shall go over into motor activities under given circumstances is a matter of great importance for us to know, and since this is commonly attributed to what we speak of as the " will," we will discuss it next.

As Ribot has remarked, " Man is led by his feelings alone," and, " It is in the natural tendency of feelings and images to express themselves in movements that the secret of acts should be sought." Spencer, expressing his opinions of what constitutes the " will," says, " We speak of Will as something apart from the feeling or feelings which, for a moment, prevails over others; whereas it is nothing but the general name given to the special feeling that gains supremacy and determines action. Take away all sensations and emotions, and there remains no Will. Excite some of these, and Will, becoming possible, becomes actual only when one of them, or a group of them, gains predominance. Until there is a motive (mark the word) there is no Will. That is to say, Will is no more an existence separate from the predominant feeling, than a King is an existence separate from the man occupying the throne." As James remarks, "The self-same person, according to the line of thought he may be in, or to his emotional mood, will apperceive the same impression quite differently on different occasions;" also, "Every one knows only too well how the mind flinches from looking at considerations hostile to the reigning mood of feeling." "Will is not an absolute power, an authority scorning help of any sort," says Compayre. "To state it exactly, it reigns but does not govern. What does govern is the ideas, the feelings."

Having seen that the will is nothing more than the supremacy of one state of feeling over that of another in producing certain motor effects, we will now proceed to obtain a more exact nature of this process. As Munsterberg says, "Perhaps we shall most quickly bring the most essential facts together, if we say that full vividness belongs only to those sensations for which the channels of motor discharge are open, while those are inhibited for which the channels of discharge are closed, and any channel of discharge is closed if action is proceeding in the opposite channel. If I open my hand, the motor paths which lead to closing my fist are blocked; and if I close my fist, the channels which lead to the opening of the hand are closed. Now if only those ideas are vivid which find the channels open, it is clear that all the ideas which would lead to the opposite action have no chance for development; they remain inhibited." This description accords with Nicholl's description of interest; interest, as we know, being a component part of all acts of will. Nicholl says, "We may criticize a man on two counts. One is for some kind of excess; a too great vanity, or talkativeness, or avariciousness, or sensuality, or diligence, or piety. The other is for some deficiency; he is stupid, or mean, or narrow, or shy, or lazy. If these qualities be turned into terms of interest, we can say that in a general sense we criticize a man either for an over-expression of interest in some form, or for an under-expression." Again, if these same qualities be turned into terms of will, we can say that the former manifests an excess of will, and the latter a deficiency. Munsterberg's description serves, in a general way, to likewise account for the phenomena of obstructed and of explosive types of will. The obstructed type of will is attributed by James to be due to either an excess of inhibition or to a deficiency of impulsion, while the explosive type is due to either an excess of impulsion or a deficiency of inhibition. However, James fails to explain which of the two factors are most likely to be involved in either of these two types of will; nor does he offer any means of differentiating between whether, in a given instance, we may say that it is an excess of inhibition or a deficiency of impulsion, an excess of impulsion or a deficiency of inhibition, that is at fault. It would seem that such a distinction is of great importance to us in a psychological way. We can hardly fail to appreciate that, under given circumstances, a condition due to an excess of inhibition would not have exactly the causes involved as would a condition due to a deficiency of impulsion, nor would a condition due to an excess of impulsion have the same causes involved as one in which there was a deficiency of inhibition.

In order to acquire a clear definition of what is involved in each circumstance, whether it be an excess of inhibition or a deficiency of impulsion, an excess of impulsion or a deficiency of inhibition, we must bear in mind the following three factors: (1) that when one motor tract is open, its opposite tract is closed. (2) that all impulses are subject to the laws of synaptic conduction. (3) that the lowered tone of nerve cells may be localized to certain portions of the brain or it may be a general physical condition.

It is a generally recognized fact that the first symptom of a fatigue of the nervous system is a tendency towards impulsive action. This tendency has been described as an "irritable weakness," and manifests itself in a quickness of response to stimuli. Again, if this process of fatigue develops in a more pronounced degree, we note a lessening of this rapidity with which an individual responds to stimuli, and, in its stead we notice a successive decrease in the degree of response as the fatigue increases. The former is due to a hypersensitiveness of the nerve-cells; the latter, to a decrease in the sensitiveness of the nerve-cells.

In those instances where we have an insufficient inhibition we may attribute it as being a symptom of irritable weakness of the nervous system, either local or general in its nature. As Ribot remarks, "The impulse may be sudden, unconscious, followed by an immediate execution, without the understanding having even had time to take cognizance of it. . . . The act has then all the characteristics of a purely reflex phenomenon which takes place inevitably, without any connivance of the will. It is a true convulsion which differs from the ordinary convulsion only because it consists of movements associated and combined in view of a determined result." It may manifest itself in acts of sudden anger, depression, etc. Again, as Ribot mentions, " Among epileptics, impulses of this kind are so frequent that pages might be filled with them. Hysterical patients would also furnish innumerable examples; they have a frantic tendency to the immediate satisfaction of their caprices or of their wants." Whether we observe insufficient inhibition in normal individuals of neurotic tendency or in the more aggravated forms of neurotic disorders we must look upon it as being a symptom of fatigue of the nerve-cells in its milder degrees. When the fatigue increases, this insufficient inhibition is no longer evident; we then have either a condition of complete inhibition or of insufficient impulsion existing. We shall discuss these presently.

Passing now to the study of conditions where there exists an excess of impulsion, we find that the causative factors are very different from those which we find associated with insufficient inhibition. Whereas in insufficient inhibition we find that " the acts are unconscious (at any rate not deliberate), immediate, irresistible, with an adaptation invariable and of little complexity," in conditions of excessive impulsion " the patient has full consciousness of the situation; he feels that he is no more master of himself, that he is dominated by an interior force, irresistibly impelled to commit acts that he reprobates. The intellect remains sufficiently healthy, the madness exists only in acts." As Ribot further remarks, " The most simple form is that of fixed ideas with obsession; " that " every fixed idea is at the bottom a sentiment or a fixed passion. Some desire, love, hatred, or interest supports the idea, and imparts to it its intensity, stability, tenacity. Ideas, whatever we may plead to the contrary, are always at the behest of the passions; but they resemble masters who obey in imagining they rule." The types of excessive impulsion may be intellectual in their origin; that is, arising in intellectual states, pure ideas (not wants or feelings), or they may be of affective origin arising from needs and instincts. Arithmomania, onomatomania, dipsomania, kleptomania, pyromania, etc., are some of the forms of manifestation of excessive impulsion. " It is sufficient to note," says Ribot, " that all these creatures of impulse have the same characteristics; they are conscious, incoordinated, incapable of struggle."

In some respects, fixed ideas bear a resemblance to what we ordinarily speak of as " habits." In fact we may say that fixed ideas are certain forms of habits, of an unusually intense nature. We are all acquainted with instances in which a certain tune of music continues recurring in our mind or the thought of a certain person continues to haunt our mind; these are but milder forms, differing from the types of fixed ideas which have been mentioned in being of relatively brief duration. Recent researches in psychological phenomena have established the fact that habits, fixed ideas, and similar actions are the effects of a single type of cause and differ only in degree. The cause of these similar modes of reaction is what has been termed a "complex."

Dr. Bernard Hart has described "complexes" so clearly that I shall quote his description of them at length. He says, "The ascertaining of the causes determining the flow of our consciousness is the ultimate aim of psychology. We shall expect, of course, that the laws discovered will be identical in the sane and insane; just as the physiological laws determining the processes of the diseased body are the same as those determining the processes of the healthy body—the difference is merely one of degree and combination in the causes concerned.

Now we may get an idea of the direction in which we would search for these determinative causes by the consideration of some simple examples. Let us suppose that I am an enthusiastic photographer. It is obvious that the existence of this hobby will continually affect the flow of my consciousness.

Scenes which would otherwise be indifferent to me will frequently arouse interest as possible material for a picture; if I peruse a newspaper an article upon photography will at once arrest my attention, and when I meet my friends, I shall seize every opportunity to turn the conversation to my favorite pursuit. We see, in fact, that the hobby is one of the causes determining the direction of my thinking. Now, if we endeavor to ascertain the exact nature of a hobby, we find that it is a system of connected ideas, with a strong emotional tone, and a tendency to produce actions of a certain definite character. Such a system of emotionally toned ideas is termed in technical language a "complex" and a hobby is to be regarded as a particular variety of complex. In the simple case just described we should say that one of the causes determining the flow of my consciousness was a strong "photography complex."

Complexes may be of all sorts and kinds, the component ideas may be of every variety, the accompanying emotional tones pleasant or painful, very intense or comparatively weak.

When the emotional tone of a complex is very intense, the action which it exerts upon consciousness becomes correspondingly great. . . . Complexes, then, are causes which determine the behavior of the conscious stream, and the action which they exert upon consciousness may be regarded as the psychological analogue of the conception of " force " in physics. They are not, of course, constantly active, but only become so under certain conditions. These conditions consist in the presence of a " stimulus," occurring whenever one or more of the ideas belonging to a complex is aroused to activity, either by some external event, or by processes of association occurring within the mind itself." While the subjective awareness of the existence and action of a complex may be present, Dr. Hart reminds us that, " A complex may exert a pronounced effect upon consciousness, although the individual himself may be unaware of its action; that is to say, he may be altogether ignorant of the causes which are really determining his own mental processes."

We see from the foregoing description of complexes by Dr. Bernard Hart that all psychic states, either intellectual or affective, are aroused by feelings of pleasure or of pain. Also, that what we ordinarily speak of as " habits," as well as those morbid conditions which we term " fixed ideas," are the result of a common factor, the complex, which is aroused under varying degrees of intensity and duration. We shall have occasion to discuss complexes again, when considering consciousness as a general process.

Returning now to our discussion of states of the will, we have that condition which we speak of as " insufficient impulsion " to consider next.

The condition which we are describing as being " insufficient impulsion " is technically termed " abulia." In what further discussion we shall make of this condition we will use this last-mentioned term.

Just as we saw, when discussing excess of impulsion, that the condition may vary from a transitory state in individuals who are ordinarily of healthy constitution and mind to those conditions which are chronic and of marked development, so we may witness this to be equally evident in regard to abulia. As Ribot remarks, " Each one of us can, moreover, picture to himself this state of abulia; for there is no one who has not been through hours of dejection in which all excitements, exterior and interior, sensations and ideas, remain inoperant, leave us cold. It is a touch of abulia. There is only the difference between a less and a greater, between a transient condition and a chronic state."

In describing individuals affected with abulia, Ribot quotes Guislain as saying, " The patients know how to will interiorly, mentally, according to the dictates of reason. They may experience the desire to do something, but they are powerless to act accordingly. There is at the bottom of their understanding an incapacity. They would wish to work and they cannot. . . . Their will cannot go beyond certain limits; one would say that this power of action undergoes an inhibition; the 'I will' does not transform itself into impelling volition, into active determination. Some patients are themselves astonished at the impotence with which their will is stricken. When they are left to themselves they pass entire days in their bed or on a chair. When any one addresses and arouses them they express themselves suitably, although in a short manner; and they judge of things fairly well." One notices here that we are considering individuals whose general bodily tone is low. What Guislain describes as being "the desire to do something" may be considered to be analogous with what has been described in a previous portion of this paper as a "thrill craving." "The muscular system and the organs of movement are intact. From this side there is no impediment. The automatic activity, that which constitutes the ordinary routine of life, persists." "The intelligence is perfect; at least nothing authorizes one to say that it has suffered the least impairment. The end is clearly perceived, the means likewise, but the transition to act is impossible." Although this condition of the will is one that is relatively the same from day to day, Ribot reminds us that, "On the contrary, when an excitation is very violent, sudden and unexpected, that is to say, unites all the conditions of intensity, it most frequently acts." Again, we might say here that it is only when the individual is "thrilled," using this term in the sense in which I defined it in a previous part of the present paper, that he reacts and that ordinary stimuli are insufficient to produce this thrill. In fact, we find in insufficiency of impulsion that the conditions existing are the same as those which were described when discussing negative passive thrills. To quote from Ribot once more in regard to this condition, he says, "If these patients cannot will, it is because all the projects which they conceive awaken in them but feeble desires, insufficient to impel them to action. I express myself thus in order to conform to the current phraseology; for it is not the weakness of the desires, considered as simple psychic states, which induces the inaction. That would be to reason from appearances only. As we have shown above, every state of the nervous system, corresponding to a sensation or an idea, expresses itself so much the better in movement as it is accompanied by those other neural states, whatever they may be, which corresponds to feelings. It is from the weakness of these states that abulia results, not from the weakness of the desires, which is only a sign.

The cause is then a relative insensibility, a general impairment of sensibility; what is attacked is the emotional life, the possibility of being moved. Whence does this morbid state itself come? The problem is chiefly of a physiological order. Beyond doubt there is in patients of this class a notable depression of the vital activities. It may reach such a point that all the faculties are affected and the individual becomes an inert being. This is the state that the physicians designate by the names of melancholia, lypemania, and stupor, whose physical symptoms are a slackening of the circulation, a lowering of the temperature of the body, and an almost complete immobility. These extreme cases go beyond our subject; but they reveal to us the ultimate causes of the impotences of the will. Every depression in the vital tone, slight or profound, fugitive or lasting, has its effect. The will so little resembles a faculty reigning as a mistress that it depends at each instant upon the most trivial and hidden causes; it is at their mercy."

In those conditions of impairment of the will which we will now consider under the descriptive title of "excess of inhibition," we are dealing with conditions "which arise from a sentiment of fear, without a reasonable motive, which varies from a simple anxiety to anguish and stupefying terror. The intellect apears intact in certain cases, impaired in others." They differ from the type of will which we last discussed in the way "that the incitation to act is not extinct. . . . The inhibition results from an antagonism." Ribot, in describing this condition of impairment of will, cites "agoraphobia" as an example and describes it as being "a fantastic anxiety which paralyses the will, and against which the individual is powerless to react, or succeeds in doing so only by indirect means." As Hollander remarks, "There are a large number of other forms, such as fear of lightning, fear of precipices, fear of blood, etc. Others manifest a dread of cancer, or other special disease. . . . The patient recognises the absurdity of his dreads, and in a feeble way strives against them; but the lassitude of will is too great to be overcome, and he returns to his fears and anxieties." Like the conditions of mania which we noted when discussing "excessive impulsion," these various forms of phobia which we observe here, are conditions where the disorder is one that is primarily in the psychic realms; that is, it is due to a lowered tone of certain groups of brain-cells, to a disorder that is more or less localized in the brain, and one where the condition of the general system may be fairly normal in tone.

Finally we may observe conditions where there is an extinction of the will, conditions in which there is neither choice nor action. As Ribot remarks, "When all the psychic activity is or seems to be completely suspended, as in deep sleep, artificial anaesthesia, coma, and analogous states, it is a return to the vegetative life; we have nothing to say of this; the will disappears, because everything disappears. Here we have to do with cases where a form of mental activity persists, although there is no possibility of choice followed by action. This annihilation of the will is met with in ecstasy and in somnambulism." Describing ecstasy, he says, "When this state is attained, the ecstatic presents certain physical characteristics; sometimes motionless and mute, sometimes expressing the vision that possesses him by words, songs and attitudes. He rarely moves from his position. His physiognomy is expressive; but his eyes, even though open, do not see. Sounds no longer affect him, save, in some cases, the voice of a particular person. General sensibility is extinct; neither pricking nor burning cause pain. . . . We have here a curious case of psychological correlation or antagonism; all that one functions gains is lost by another; all that is gained by thought is lost by movement. In this respect, ecstasy is the opposite of the states in which motility triumphs, such as epilepsy, chorea and convulsions. Here we see a maximum of movement with a minimum of consciousness; there, intensity of consciousness, with minimum of movement. There is at any moment only a certain nervous and psychic capital disponible; if it be absorbed by one function, it is to the detriment of the others. Its employment in one direction or the other depends on the nature of the individual." In regard to this last statement of Ribot's, it seems more justifiable to say that this use of nervous force in either one way or the other is not so much a matter of the quantity of this force but that it is a phenomenon which accords with the laws of nervous functions, as Munsterberg has postulated them; that when certain nerve-tracts are open and discharging nervous force, those tracts which would permit the display of opposite actions, are closed. We are to suppose here that not only is this opposition of action a factor which is observed in certain physical motor activities but that there exists an opposition between purely intellectual activities and those of a purely physical kind. Further, we have already noticed that a given stimulus may serve to produce an immediate motor response, or it may receive a response of a non-motor character; that is, it may bring about an extended process of an association of ideas; the force may be used "in an intellectual way."

Whether we are considering one of these forms of will manifestation or another; whether it be, on the one hand, those extremes of activity which we note in excessive impulsion; the almost complete absence of activity, which we note in extinction of the will, or any of the intermediate forms that have been described, in all instances we are merely observing particular forms of manifestation of a single phenomenon acting under different internal or external circumstances. In some instances we note a predominating physical weakness, a general lowered bodily tone, as being a fault. This was especially noticeable in those forms which we considered as "insufficient inhibition" and "insufficient impulsion." In other instances we noted that the fault was more localized; that it was not so much due to a general lowered bodily tone but was primarily a disturbance in the cerebrum, a lowered tone occurring in certain groups of brain-cells. This condition was found to be present in what we described as "excessive inhibition" and "excessive impulsion." Again, in all instances, we note that the will is guided and affected by feelings of pleasure and of pain. Finally, we may note that certain forms of will manifestation, which we have been considering, show, in a general way, a tendency to exhibit the predominance of certain types of thrills: the forms of wills described as "insufficient inhibition" and "excessive impulsion" showing negative active thrills, and the forms of will described as "insufficient impulsion" and "excessive inhibition" showing negative passive thrills.

In considering the various factors of which all psychic activities are constituted, it has been very difficult at times to make a separate description of each factor, since all are so intimately related. This was especially true when we attempted to subdivide each phenomenon described. Not only did we note that each factor was intimately related to every other motor factor, and dependent upon it for its presence, but we likewise noted that all the phenomena, in turn, were directed by the feelings of pleasure and of pain; that is, these two factors determine what form of activity is needed from moment to moment in order that the individual be in relation to his environment. However seemingly absurd some of the factors, which we have been considering, may appear as attempts at this adjustment, we must nevertheless bear in mind that in all instances, without exception, an individual acts in that way which it feels, either consciously or unconsciously, is best under given circumstances. Sometimes it is the relief of pain; at other times it is the seeking of pleasure that appears most prominent in an individual's particular conduct of the moment. In either event we must consider that it is the pursuit of happiness, the seeking to attain a sense of "physiological well-being," that is the guiding ideal. Whether we are considering this factor of the "ideal of physiological well-being," in terms of attention, interest, habit, will, emotion or instinct, all of these phenomena are but factors whose activity is motivated towards the attaining of happiness and the freedom from pain; and since it is the combined effects of all phenomena which we have been considering that go to make up "consciousness" in all the varying degrees of its existence, we may in truth say that the ideal of well-being is the ultimate aim of our existence and that thrill-cravings and expressed thrills are the means whereby this ideal state of being is most effectively and immediately attained. We may then say that the emotions, instincts, attention, interest, will, and the other factors are but means whereby thrills are sought and are experienced; and which, in being experienced, afford to us a temporary relief from the feelings of stress that are brought about by the repression that civilization has placed upon our more primitive desires and actions.

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PSYCHOLOGY AND INDUSTRY[1]

By G. Stanley Hall

When your distinguished President honored me, a psychologist, with an invitation to speak here today to you engineers, he will bear me witness that I was surprised, and hesitated. And well I might, for one does not often hear of a student of human nature saying anything to which students of physical nature care to listen. But in fact, however, there is or ought to be today a new and most significant *rapport* between us, and therefore I could not, despite many limitations, quite justify myself in refusing this invitation which seemed to me something of a challenge. And so I invite you to consider with me a few of the human factors in our modern industrial life.

At the outset let us remember that modern man, *homo sapiens,* or human nature as it exists today, is, at the very least, one hundred thousand years old (some think far older), while the revolution that introduced modern industrialism is less than two hundred years old. On this basis man is five hundred times as old as his industrial system (Ordway Tead). From this it follows that the basal laws of human nature are somewhat like those of physical nature, relatively fixed and constant, and that they must be studied and adjusted to, for they are hard to change compared with our very recent industrial, to say nothing here of our social and political institutions.

All great movements of history and pre-history have been products of unrest and of man's struggle to make or find an environment that better suits his nature and his needs. It took the world a long time to learn that religion was made for man, and not man for religion. More recently we have been learning that the school was made for the child, and not the child for the school. Today we are in the midst of the same Copernican revolution in industry and are beginning to realize that it was made for the better development of man, and not conversely. It, too, can never be stable until it fits human nature and needs.

But let me say at the outset that the nascent but inevitable advent of democracy into industry is not to be attained by any bolshevik program of confiscation or nationalization of capital; nor by any form of government socialism, or by the French or any form of syndicalism; nor by any modernization of the medieval guilds; nor by any development yet in sight of the efficiency system, which has so far contributed almost as much to the discontent of Labor as it has to the effectiveness of organization; nor even by the full program of the Whitley reports. Permanent and settled industrial peace and good-will can only be found in a full and unreserved coöperation between Capital and Labor, with some complete scheme of joint control and profit-sharing, involving more knowledge by the laborer of the business as a whole and more loyalty to it. This alone can bring harmony, avoid the excessive waste of friction, ill-will, sojering on the job, labor turn-overs, strikes—of which an official report a few months ago told us there were 365, or one for every day of the year, on at that time in this country—and all the other wastage of energy from unemployment to sabotage. All these disorders which are so ominous for the business and economic future of this country and its supremacy in the markets of the world are, in a sense, of psychic origin, and the cure must be sought by a better knowledge and a wiser regimentation of the mind of labor.

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[1] Address given at the Commencement exercises of the Worcester Polytechnic Institute, June 10, 1920.

Can we ever hope to accomplish the colossal engineering with the forces of Mansoul which will bring accord where there is now a discord utterly without precedent? I think we see the direction and some of the first steps toward this goal.

But before designating these, let me first remind you that psychology has, almost within a decade, made a great discovery which is very much in point here, viz., that of the unconscious side of man's nature. The field of consciousness, which used to be our muse, is far too narrow, so that man very rarely knows what he really wants or what are the causes of his troubles. Consciousness is like the one-ninth of an iceberg that is above the water, once thought to be guided by the winds while in fact the impelling force is the currents of the denser medium in which the other eight-ninths are submerged. How often we think we are doing this or that by this or that means, when we realize later in fact, as history does for mankind, that very different goals were really sought for! Thus the mind as we knew it before is like a port of entry and departure for a vast hinterland, or like a clearing-house. Thus with all social and political movements, as well as with industry, we have to look under the threshold of the mind for real causes. In this era of the unconscious we are now doing that as never before in every field of thought. It is a little as if the individual and the race had found a new and larger soul, so that the past, present, and future require reinterpretation.

In view of this let us enumerate a few of the deeper primal needs of man on which his tranquillity and effectiveness depend, quite as often and perhaps more unconsciously than consciously, and failure to satisfy which makes for unrest and sometimes for revolution.

(1) The first of these is the homely need of sufficient and fit food and drink. Nutrition is the basis of life. The first use of every sense, all of which are located near the entrance of the alimentary canal, was as a food-finder or tester. A large part of the intelligence of animals which we marvel at as instinct is directly developed by and from the food quest. The voluminous studies of the Pavlov school show us that anything that comes to be associated with food for the animal or for the human infant becomes an organ of apperception. All migrations of animals and also of men have always been from areas of scarcity to those of more adequate food supply. Many studies show, too, the effects of sub- or mal-nutrition in children. The under-nourished are far more fatigable; they have less power to resist infectious diseases and to recover from wounds, injuries, or illness; they are more likely to be arrested before the later, higher stages of physical and mental maturity are attained; and they are far more nervous and irritable. There is a marked correlation in children between subnutrition and runaways, truancy, and theft, which often begins in the theft of edibles. Very slight nutritive defects are often summated for months and years, as, e.g., a slight insufficiency of salt, long continued, causes flocks of animals and tribes of men to trek till this nutritive deficit is compensated for. Who can doubt that the general recent food shortage, especially in Central Europe, has much to do with the general unrest there, or that taking away the tipple to which the workman was long used is another contributing if unconscious factor in every kind of discontent, for the new nutritive balance that prohibition requires always causes men to make more demands upon the home table or dinner pail and thus brings added responsibilities to the housewife. The working man is, in some respects, peculiarly dependent upon his dietary, and the lank and hungry are predisposed to listen to radicals.

The many researches in this field show that it is the early stages of a long fast that cause most disquiet, and also that a stated reduction of food to a half or quarter of the normal, while it sustains life indefinitely, is vastly more disquieting and painful than is complete abstinence. When from food insufficiency the body begins to draw on its own reserves and consume itself, taxing as it does the various organs and functions in a rather definite scale, some of them losing a tenfold larger percentage than others, not only efficiency but character undergo certain degenerative changes, and there is a diffused anxiety which suggestion may cause to focus on almost any object in the environment. Thus the underfed man not only can do less work and does it with more friction, like an engine only partially fueled and oiled, but he becomes more or less combustible at the touch of any kind of agitator. The dread of insufficient food in the near future is another grain of sand in the machine. Thus, in fine, we are realizing as never before what a dangerous factor in politics, society, or industry, protracted and prolonged sub-or mal-nutrition may come to be. Napoleon said that the best reinforcer of courage in the soldier was to be able to " fight on a full belly," and the morale of labor of every kind rests no less squarely upon the basis of metabolism. So our great industrial army, which works on its belly, needs a new Hooverism, which science and many social agencies are now, at least in part, prepared to supply.

If the daily ration of food or nutritive values throughout this country were cut to one-half or one-third, as for the bourgeoisie in bolshevik Russia, or even to one-fourth of the normal need, we should live on indefinitely and even " carry on " after a fashion; but efficiency would gradually sink in nearly the same proportion; our national disposition, buoyant and optimistic, would sag; accidents would multiply; our mores and morale would decline; and the growing dis-ease would start or augment every tendency in the direction of revolution and even anarchy. Miss Gamble tells young women the best way to manage a husband is to keep him well-fed and never allow him to get thirsty. No matter what policies or treaties nations adopt, the world can never hope for assured and lasting peace as long as its food supply is insufficient and insecure.

(2) The second basal need of man is wife and children. This is the racial as hunger is the individual factor in the mental hygiene of industry. It roots in and irradiates from the sex urge, from which evolve all the secondary sex qualities of mind and body which make the family and the home, and which is sublimated in the higher forms of culture, social life, and religion. Statistics show that married men are more conservative, less prone to rove, have more incentive to earn, save, and look ahead. But they need a larger wage, and if their loved ones suffer privations, their exasperation at hard conditions is more intense and perhaps desperate. These nor-

mal domestic and family instincts, if thwarted or repressed, sooner or later find vent in subtle mental distempers which psychiatry is just beginning to understand, or else in social and industrial revolt, the real cause of which is also deeper and other than we have hitherto realized. Studies of the I. W. W. show how many of its members have never known or have thrown off all family ties, and one writer estimates that in the last ten years there have been fifty thousand clinical cases which show lives wrecked or gravely jeopardized by perversions of the *vita sexualis* in the new and larger light in which this is now interpreted. The workman loves his wife, children, and home as much as, and some would have us believe more than, the millionaire. He feels every pang and slight as acutely, he is no less solicitous for their present well-being and future career, and is probably more ready to make sacrifices for them. The wifeless, childless, homeless man is not only a greater industrial risk but is prone to turn to vicious vicariates for these domestic instincts, for without these hostages to fortune he is prone to focus on self the affections meant for posterity and the perpetuity and improvement of the race. It is not so much the pithy hints on sex hygiene, which did so much good in the army, that the workman needs, although this does good; he needs more a few of the basal principles of eugenics, which Galton thought the religion of the future, but most of all he needs incentive and opportunity to take a mate and start a family near the dawn of the now rather well-defined age biologically best for nubility and procreation and not after its heyday has begun to fade and he has learned to satisfy these racial needs by inferior surrogates. Perhaps in no domain of our modern life is there so much new knowledge so unapplied today, but from which we may hope for so much in the near future.

(3) A third basal instinct never so strong as since evolution became the watchword of culture and in a true democracy in which the way to the highest is open to the lowest, is the impulse to get ahead, to progress, to improve, to make the most and best out of this present life. The motto of even the ever fewer who have some vestige of belief in a future life of compensations is "One life at a time, and this one now." This urge is seen in the millions of young and middle-aged men taking extension, continuation, and correspondence courses, either to make up for neglected opportunities in the past or to keep abreast with the very latest advances of knowledge and skill. Nowhere does the fate of that vast multitude of unskilled toilers in the world, who, as statistics show, at twenty have reached their maximum of industrial efficiency

and see nothing ahead but decades of the same drudgery, seem so intolerable. Nowhere are parents so anxious that their children should rise above their own estate, and nowhere does the merely living wage seem so exasperating. This country was peopled from the first to now by those in the world who were restless at home and sought and expected more freedom and more possessions or both, and this American-itis, as we call its extreme form, colors our every industrial and social problem. In so far as we have escaped the old-world stratification of ranks and classes, we have bought this immunity at the high cost of having a horror of inferiority and stationariness unprecedented in history, to say nothing of the all-dominance of mediocrity. The reorganization of labor must reckon with this tendency and realize that the standard of living of the workman must be indefinitely improved so that he may be able to lay by for the future rather than be dependent upon old-age pensions and accident- and health-insurance, which are too paternal for the American spirit. This spirit, I fear we must realize, nothing will ultimately satisfy short of profit-sharing, although we admit that this involves practically joint ownership with capital. To this, I fear, too, we can see no alternative except the desperate and unpractical one of either sovietism or the free importation of Mongol or other cheap labor, unless, indeed, some of our interests have to go where labor is instead of bringing it to us. The instinct of ownership, which has made some ten thousand millionaires in this country, is strong in every American, who perhaps on the whole prefers wealth to anything else in the world. To hold property, even a little, not only makes for conservatism but extends the limits of personality, making the holder alive to everything in the environment which affects his interests. It is thus one of the most educative and man-making of all the agencies in the modern world, and if it represents real service in the community, it is, on the whole, the very best measure of worthful citizenship.

(4) Another very basal impulse, one of the chief traits of man, is the noetic instinct or curiosity, the lust to know and understand the environment, which began with the very development of the brain and has culminated in modern science. This dynamic urge is strong, in some sense stronger, among the ignorant and technically uneducated who realize their limitations. Even the illiterate workman has his intellect and is bound to use it wisely or otherwise. He welcomes everything and everybody who makes a pungent appeal, as radicals and agitators with their cheap and easy and often perverse solutions of all great questions surely know how to do. His

mentation may be ever so rudimentary and collective, as in the mass and mob, rather than individual, but mental pabulum of some kind he must have, and this need is as great as that of his body for food. Under the old guild system he found scope for his instincts in the craft itself, but this the ever-increasing specialization of modern mass production denies him so that he seeks to escape mental suffocation by listening to propagandists of revolution.

Kirschensteiner has evolved culture courses for some forty trades and occupations, so that a boot-black, e.g., knows something of leather, the history of footwear, etc., while the chimney-sweep knows the rudiments of combustion, ventilation, of the chemistry of soot, and thus not only can he use his brains as well as his hands but the two work together and not in separate domains. The ditch-digger is taught something of drainage, sewerage, etc. It is a faint dawn of the recognition of the noetic instinct that has prompted a few firms in this country to do some one, some several of the following things.

Some make periodic shifts from one process to a very different one so that each workman becomes familiar with several, and a few have a regular rotation by which each may acquire some skill in most processes. Sometimes workmen are taken in groups through the entire works by one employed for that purpose who explains to them everything so that they may see the bearing their particular process has on the finished product. This may take months in a large concern, but it is said to pay. Movies, too, are called into service in various factories so that at intermissions or at the close of certain days men can see all the processes on the screen. Other firms have gotten up and given freely to every employee elegantly illustrated textbooks, e.g., a leather book, steel book, harvester book, automobile book, etc., and this has stimulated interest, sometimes to a high degree. Others have inaugurated a new kind of shop committee, not to confer on the question of wages but on processes and labor-saving devices and to advance joint interests. Automatic machinery, e.g., a cotton loom, can be so loaded with shuttles that it will run, with no man in the building, for several hours and then stop, and this makes for the shortening of hours. Still other firms encourage bringing in visitors, especially the families of the workmen, and showing them through the mill, for this is thought to have a stimulating effect upon the activity of the workman, not only while the visitors are looking on but afterward for he wishes to show his skill and dignify the importance of his work. In some establishments every process is checked off to the individual so that any defect, even when discovered a long time afterwards, can be brought home to the operator. This increases his sense of responsibility and also helps to develop a pride in good work. Other agencies which enable every worker, in ever so narrow a specialty, to see the whole are often supplemented by civic instruction because many of our workmen come from hard conditions in Europe, e.g., the Russians in whose country factory conditions were as bad as serfdom, so that here they are prone, all the more because of their disappointments in coming to this land of promise and rosy dreams, to give vent to all the antagonisms that were justifiable in the old country but utterly baseless here. The instinct and the example of so many educated rich young men in England in going to the colonies, and here in going West or beginning at the very bottom of an industry as working men in overalls in order to test themselves out and rise according to their abilities, is also in point.

But we must not forget that this same instinct impels labor to seek to know all about the profits and dividends and perhaps to become small stockholders, an ambition that some firms are now doing so much to help it realize and which perhaps all should do. The workman also has wider outside interests as a citizen and a member of society, and these we should do far more to guide into the right channels and set backfires to check counsels of violence and direct action. Our government at the beginning of its campaign against the " reds " burned all their literature, as Comstock did that of vice, but has lately seen new light, so that the post-office department now selects samples of every scrap of seditious and anarchistic literature, even to clippings. This is perhaps the most complete collection of its kind in the world, and is used not only in criminal deportation or espionage cases but will be available for future study by the social clinician. Our academic economists and even sociologists, freed from the excessive war censorship, are now doing invaluable work for the diffusion of sane ideas, which are bound to be a great factor in the harmonization of capital and labor, slow and hard as this campaign of education is going to be.

(5) It has been said that almost no man is so feeble or deficient in mind or body that he cannot excel in something, and conversely that the very best man will fail if he finds himself in the wrong place. Psychology is just learning how immensely individuals, even those of the same rank and training, differ from each other, and how immeasurably more effective our entire industrial system would be if we could only put and keep everybody where he would be doing his best thing. Perhaps no single device would accomplish more to give our

country the industrial supremacy it merits and now has the unique opportunity to attain in the world than the very arduous one of getting all the square men in the square holes and all the round men into the round holes rather than vice versa, which means wastage incalculable. We are tunneling this problem from both sides of the mountain; on the one hand, we have those who devote themselves to job analysis, finding just the traits most necessary for each vocation and even each specialty, and, on the other hand, vocational guidance studies individuals to find *the* one thing that nearly all can do well. We know the incalculable service that the personnel department rendered in the army by listing not only the trade but from three to five degrees of proficiency in it which each soldier had acquired, utilizing thus all the skills required in time of peace. Now there is a rapidly growing recognition of the advantages of the same differential psychology for the arts of peace. True, much of this work has been done hitherto by amateurs and even fakirs, but many firms are now seeking trained psychologists to test their employees and assign them to that place in the system for which they have the best native or acquired aptitudes. With aptitude, it must be remembered, goes taste and interest, so that not only productive efficiency but content is thus augmented. We have long realized, and are doing so now more than ever before, the growing specialization necessary for effective large-scale production, but we are only just beginning to recognize the fact that Nature itself has specialized individuals vastly more than we had supposed, so that in all this work we are simply utilizing the energies that Nature had already preformed but which had long lain at our hand untouched. Almost pathetic are some of the tales of workmen whom only a slight analysis would have rescued from doing things for which they were utterly unfit and put to things for which they were preeminently fitted, thus rendering them not only happier but more secure and, where a differential wage system prevails, often able to earn more. Unless all signs fail, the time is at hand when everyone, before finally entering upon his life work, whether at the end of his required schooling or at graduation, will have more self-knowledge, and when institutions that give diplomas will also study each individual more and be able to advise and guide him better into the career that promises the most for him.

(6) Man is the most gregarious of all animals, and gregarious animals are far more intelligent and more domesticable than those of solitary habits. Compare, for example, the dog and the cat. But man is the most gregarious of all creatures and was so even before the time his simian ancestors descended

from the trees. The prehistoric Cro-Magnon race eliminated the well-established Neanderthals in primitive Europe because they had a far more elaborate social organization. Man's very soul languishes in solitude, and there is no such stimulus as that of intercourse. We have lately listed 113 types of child organizations but no one has ever attempted to list all the thousands of organizations that have sprung directly from the herd instinct in adults.

The passion to get together and act collectively, which is seen all the way from the street gang and mob to the club, sect, and party, marks man as preeminently *the* herd animal. It is this instinct that depletes the country for the city, that is one factor in the difficulty of drawing servant girls or farm hands to the country. The individual needs to merge with his fellow-beings, and most of our thinking and still more of our feeling is done collectively in groups. Our conduct is made up, for the most part, of suggested action, and habits and character are molded by the social milieu. There are few psychic horrors greater than those described as due to long confinement or isolation that is really solitary, and when condemned to this the soul instinctively "pals" with the lower forms of life or invents imaginary companions.

This instinct was one of the chief charms of the saloon, and now that we have dispensed with it, the workman finds a vicariate for his social instincts in the trade union, which is thus greatly vitalized, or perhaps even in the excitement of the strike. All this shows that for this instinct of assembly, of getting into frequent and close rapport with his fellow-men provision must always be made, for every kind of wholesome convivium vents and releases a strain and tension which may break out in riotous form. Never has trade solidarity and consciousness been so intense as it is today in this country, to say nothing of the soviet in Russia and the syndicalists in France, so that we have here new forces to which we must readjust.

I have thus tabbed off and very inadequately sketched the six instincts which, as I see it, psychology deems oldest and most basal. There are, of course, plenty more, and there is still much diversity of view as to the relative importance and strength of the fundamental as well as of the accessory energies of Mansoul. There are also many other very different chapters in the relation of the science I represent to industry, viz., the psychology of skill, of employers, of efficiency and inventions, etc. But I think that I only voice the deep conviction of every worker in this field in saying that the world is now entering a new psychological age, which perhaps the historians of the future will call another renaissance in recognizing the significance of psychic forces in the world, forces often too deep and large to enter the narrow field of consciousness. Primal urges of the soul, some of them as old as animal life itself, set in action currents that have behind them the whole momentum of evolution. Manifold as are the expressions of these primordial instincts, plastic as human nature is in adapting to new environments, in some respects its basal traits can no more be changed than can the laws of physics and chemistry.

Unless all signs fail, too, the time is at hand when every workman and every graduate will have more self-knowledge of his powers and weakness, aided, perhaps, by the tests of experts. In this respect the world needs a new and wiser statesmanship and diplomacy and is halting and distracted for want of a new leadership in industry, a new goal, and a new education.

Never were there so many open questions, never so much human energy so suddenly released as that which the war has mobilized, never such distrust of leaders and so loud a call for bigger and better trained men, never so many ways open to those at the stage of choosing their career or definitizing its details. May we not say that the graduates of this year in our own country and abroad never before in history went out into a world so throbbing with so many and intense interests and issues or in which there were so many possibilities of success or failure, dependent very largely on how well and truly we know ourselves and man, the highest study of mankind. Never was there a time when men in the later decades of life so longed to be young again like you. It was said of old that as Oxford and Cambridge think and feel, so England will go thirty years later; and now a leader of British thought says fifteen years later, for as the world war was fought by young men, it is they who will decide the issues of peace. As the instincts of young men are the best material for prophecy, so my closing admonition to you would be that in such choices as you may be called on to make affecting your life work do not be guided too much by opportunities and openings promising immediate advantage but also take counsel of your own deeper interests, even perhaps at some temporary loss, and seek the place where you can do your best thing and grow in it, and having chosen, aim at nothing short of mastery. Know your calling from the ground up, be an authority in it and not an echo, do not fear but cultivate originality, and do what you can to make industry a servant and not a master in the economic household. Remember that the supreme test of every institution is how much it contributes to bring the race on toward an ever fuller maturity.

There is a perhaps yet larger view at which I can only hint in closing. The war saw us a united country, with partisan and class interests entirely subordinated to a great end. We even had a unique solidarity with all western Europe and our own eastern frontier was, for a time, the battle-front, and in the early days of the conference at Versailles the whole world throbbed with the high moral idealism of the Fourteen Points, which promised a new era if not the federation of the world which poets and idealists had long dreamed of. But now what a change has come over us! We now think only of our own frontier on the Atlantic coast and are at odds with our allies. Partisan strife, stimulated by the enormously increased government patronage, was never so bitter; class was never so hostile to class; interests never so active or potent; never were there so many irreconcilables who cannot compromise, to do which is the very essence of statesmanship and leadership of every kind; never were there so many profiteers, mad with the lust of individual or corporate gain; never has our government or Congress fallen so low in the respect of the people or been so recreant in the colossal task of meeting the new needs of the country! Coleridge said that those who begin by loving country more than they love mankind are likely to lapse into loving party more than country, sect more than religion, their business more than the welfare of the community in which they live, and will end in the supreme selfishness of loving themselves and their own personal advantage more than anything else. Are we doing anything to reverse these tendencies, to make democracy safe for the new nations which are now adopting it, or are we strengthening or weakening our own trust in it? Are there dollars in everything we seek, and is the merit of every cause to be measured by the success of "drives?"

Once mankind sought salvation in religion and there was a passion for self-sacrifice, which went so far that the church fathers had to call a halt on the rage for martyrdom. Men took vows of poverty, chastity, and obedience. Christianity gave all the Occident a new life, but the church today, beneficent as it is, seems to have lost its power to cope with selfishness. It is slow even to recognize the great new light of the higher criticism which offers it new sources of power. In the Renaissance education was the panacea; schools and universities were founded and a holy war waged against illiteracy, and science promised regeneration. Now all of our institutions are, and with abundantly good and just cause, bending their energies to secure ampler funds. But which of them has yet reconstructed its curricula to meet the new needs of the new age that is upon us or realized that if they had provided us with better leaders, the immediate past would not have been so tragic or the future so full of forebodings in a time when every settled consensus is shaken and men are even questioning the foundations of our most cherished social institutions. This may seem pessimism, but it is not, because, at least for the psychologist, there is hope in the bottom of the Pandora box which Fate has now re-opened. There is one and only one source to which we can turn for hope that evolutionary processes will not be reversed but go on, and that is to the unconscious, instinctive nature of man, which in the past has evolved language, religion with all its deities and rites, every social, political, and industrial institution, and, because man is a herd animal, devised so many ways of checking egoism. His sentiments, feelings, instincts are as much vaster than his intellect as the folksoul is greater than the individual, and in human nature, as all progress bears witness, the good predominates over the bad. It is these deeper currents in the human soul that have wrought every salvation in history, and from this source alone can salvation now come. We do not yet know how. It will come by no panacea, and it will not come suddenly but will be so slow and hard that the patience of the world is likely to be tried as never before. It may not come from us who study the human soul because its problems are too vast for us, but it is well that we are beginning to feel a new responsibility for uncapping its energies. We are at the stage where chemistry was perhaps in the days of Lavoisier or physics in the days that preceded Newton. But our young men are seeing visions and our old men are dreaming dreams of an age when psychic forces will be just as dominant in every great enterprise of man as science is today in industry. Nor is our attitude toward this expectation of a new dispensation involving altruism and mutual help merely that of watchful waiting, but we see already many hopeful beginnings. And that is why, realizing the world's pressing need of a new ethics and a new morale, which is almost the diametrical opposite of the superman, we are optimistic and believe in a new and higher democracy yet to come which will be a real city of Mansoul.

BOOK REVIEWS

Recent Literature on the Child

The Dawn of Mind. By Margaret Drummond. N. Y., Longmans, Green & Co., 1919. 179 p.

The Problem of the Nervous Child. By Elida Evans. N. Y., Dodd, Mead & Co., 1920. 299 p.

The Mental Hygiene of Childhood. By William A. White. Boston, Brown & Co., 1919. 193 p.

La Escuela Secundaria en los Estados Unidos. By Amanda Labarca Hubertson. Santiago, 1919. 325 p.

Kinderideale. By. Dr. Heinrich Maner. Kempten und München, Jos. Röselischen Buchhandlung, 1914. 155 p.

Statistik des Kleinkinderalters. By Dr. Hans Guradze. Stuttgart, Enke, 1916. 28 p.

Margaret Drummond's *Dawn of Mind* is a rudimentary little treatise which is excellent from the viewpoint of orthodox psychology and child study, but which neglects all the newer knowledge of the mental life of childhood which has been gained by psychoanalysis and the psychology of the emotions. She begins with an elementary description of the nervous system, which is entirely accurate except that it overlooks the newest findings of neurology which indicate that new neurones are formed for two years after birth. The second chapter discusses the development of the baby's sensory world, with its original lack of color, definite shapeliness of objects, etc., which gradually approaches the adult norm all through the first two years of life. After the simple sensations have evolved, there comes the period of association of sensations, when the child connects the appearance of an object with its feeling to the touch, or of sounds with visual sensations, and all the other combinations which contribute to a complete understanding of the environment.

Miss Drummond classifies the first instinctive movements as grasping, sitting, creeping, rolling, kneeling, standing, walking, climbing, running, dancing and jumping. When she comes to discuss the life of instinct and emotion in full, the author follows the MacDougall scheme, speaking of the simple emotions of fear, anger, tender emotion, positive and negative self-feeling, disgust and curiosity and wonder, and showing how from these are built up the complex sentiments of gratitude, awe and reverence.

The first form of memory is styled by Miss Drummond as memory by recognition. She thinks that the baby recognizes familiar objects long before he is able to form any independent mental image of them. She maintains that visual imagery first appears in dreams, but is less certain when sound imagery appears. The baby learns to recognize the mother's voice at an early stage of its existence, but perhaps the images of sound appear when the baby is first able to reproduce a tune. Motor memory shows itself very early in the way the baby adjusts its limbs for the dressing process, in learning to feed himself, etc. The verbal memory is especially active during the early months when the child is learning to talk.

Miss Drummond emphasizes the child sympathy and suggestibility, but it is perhaps impossible to emphasize too much what she terms "the child's tendency to catch emotions from others." It is this same characteristic of childhood that the psychoanalysts have emphasized in noting the conformation to the parent ideal and in the social conditioning or environmental modification of the emotional response. Its importance in determining the future of the individual has only recently been assigned its true evaluation. The chapter on "The Unlucky Baby" also confirms the findings of psychoanalysis, although written with a very evident lack of knowledge of that subject. Its account of the baby whose mother was insistent on doing all things for him, and his subsequent development, conforms to the numerous psychoanalytic cases which show the conflict between the desire to remain a child and the necessity for emancipation from parental control.

By far the best book in its field up to the present date is Elida Evans's *Problem of the Nervous Child.* It receives the endorsement of Dr. Jung, of Zürich, and is entirely worthy of the commendation which he gives it in his introduction. Its scope is somewhat suggested by the chapter headings, which are as follows: *Statement of the problem; The development of repression; Symbolic thought; The child and the adult; Mental behavior of the child; Defence reactions; The parent complex; Buried emotions; Child training; Muscle erotism; The tyrant child; Teaching of right and wrong; Self and character.*

With much more insight than Miss Drummond, Mrs. Evans comments upon the imitative tendency of the child and its unconscious response to the emotional attitudes of its parents. She shows that these may be either positive or negative in character,—that is, the child may accurately copy the emotional reactions of one parent or the other, or it may react in exactly the opposite manner, according as the parent becomes an ideal or an antagonist in the child's mental life. Jung, himself, has not brought out with more force or vividness the conflicting motives of infantile regression and necessity for emancipation from the parental guidance than has Mrs. Evans in her clear-cut generalizations and in her well-chosen case studies. There could indeed scarcely be a more sane and convincing presentation of these significant points of the family situation.

In her conception of the libido, Mrs. Evans is entirely in harmony with the common teaching of the Zurich school. She describes the libido as "an emotional force or urge which is in every form of life, whether vegetable or animal," and holds that it is the force which is inherent in life and love and evolution, an energy both racial and individual. It is the psychological analogue of the physical forces of nature which are manifest in the wind, in electricity, in radio-activity. It is in the libido-potential of the individual that all his possibilities of development lie, and the fulfillment of those possibilities depends upon its unobstructed and normal expression in various activities and sublimations.

The illness of the neurotic child may be due to one of two motives which must be guarded against. On the one hand, it may enable the child to remain in the shelter of the parental care, and allow it to avoid the facing of the responsibilities of adulthood. On the other. it may satisfy the longing for power, and enable the child to become the household tyrant and center of attention. Neuroses which develop later are very often an attempt to escape the marital relation and satisfy the desire to return to a beloved father or mother. These are the familiar father and mother complexes with which psychoanalysis has long since made us familiar. More interesting are Mrs. Evans's accounts of the "muscle erotics," who represent a sexual arrest and can only find satisfaction of their adolescent cravings through incessant muscular activity and excitement.

All these motives of child behavior, if rightly understood by parents and teachers, furnish an invaluable guide to the training and education of the child. The best way to teach the child the difference between right and wrong, for instance, is by example rather than by precept, since the response to a situation is so often a matter of unconscious imitation rather than obedience to instructions. Parents must realize that too much love tends to make the child a weakling, incapable of bearing the adversities of life, just as too much harshness renders him defiant of all restraint and dangerously rebellious against social as well as parental authority. They must also realize that it is their duty to guide the child into a free existence, to permit it from the earliest years to make its own choices in every possible situation, in order that the adult individual may not be a weakling and a degenerate. In the performance of this duty, they will receive automatically a rich reward, for instead of the childish love which they relinquish, they will find their liberated sons and daughters returning to them a deeper and more loyal affection such as only men and women are capable of giving.

Altogether, Mrs. Evans's book is a splendid presentation of the best knowledge that psychoanalysis has been able to give us concerning the deeper motives of human conduct, and her case studies are illuminating in showing the practical application of these principles to the concrete problems of childhood. It is obviously written by a widely read and broadly experienced woman, with a real and adequate understanding of her subject.

Dr. White's book covers a part of the field which Mrs. Evans has treated in her volume, but is much more generalized, and lacks the concrete illustrations in the case studies that make her work so convincing. He begins with the concept of the child as the link between the past with all its vast heritage from primitive and even animal ancestry and the future with its untold potentialities. It is an old figure to students of evolution, but Dr. White treats it in a manner which should win sympathy from the popular mind. Indeed, the keynote of the whole book is its simplicity and directness, which eminently fits it for the reading of the general public.

According to Dr. White, modern psychology attempts to interpret human conduct as "a series of actions brought about for the purpose of changing conditions to make them more in keeping with the desires of the individual." These fundamental desires of the personality fall into two prime categories, the race-preservative and the self-preservative. The various activities of the child, therefore, all occur as an expression of one of these desires or instincts, but in the human child they are very complex activities because of the psychic ramifications of the two instincts which are almost illimitable. It is therefore better to say that human conduct has for its chief motives the will to power and the longing for pleasure, which are the sublimated expressions of the ego-urge and the sex-urge, respectively.

Dr. White goes on in the approved psychoanalytic vein to discuss the effect of repressions on the mental life of the child, and to consider the role of the parents, etc. His statements are always clear and accurate, but give the impression of lacking the wide and intimate knowledge of individual children that is apparent throughout all of Mrs. Evans's treatment. Yet because of his explicitness and clear presentation of guiding principles, his book is a good supplement to hers. It may therefore be enteresting to compare his chapter headings with those of Mrs. Evans which have been previously quoted. They are as follows: *The child; The fundamental instincts; The development of the child; Stages of development; The family situation; Problems: education—punishment; Further problems: sexuality—repression—play; The function of the parents; Historical background; Conclusion.*

If we would see ourselves as others see us, we have only to look at the account of our educational system given by Senor Hubertson in *"La Escuela Secundaria en los Estados Unidos."* It is simply a detailed account of our secondary schools, their administrative organization, plans of study, programs and methods, the internal administration of directors and teachers, recently introduced courses such as domestic science, etc. It is hardly worth while to epitomize the contents of the book, since they are familiar to most English-speaking readers, and the Spanish-speaking student would find it more satisfactory to glance through the book itself, and particularly at the numerous charts and illustrations. The author thinks the chief difference between the school systems of the United States and of the European and South American countries lies in the greater centralization of educational control in the latter places.

Dr. Maner's book on *Kinderideale* is a summary of the answers to the following questionnaire which was given to 1,499 boys and 2,095 girls in the fourth, fifth, sixth, seventh and eighth years of school:

What person whom you know or of whom you have read would you most like to resemble? Why?

What would you most like to become? Why?

What book or what history do you like best? Why?

Who is your dearest friend? Why?

During school years, the ideal of the child is transferred from some member of the family circle to a person in the outside environment. At 10 years of age, for example, the children in the fourth year of school still retain the family ideal in the case of 30% of the boys and 43.7% of the girls. But by the time the eighth year of school is under way, this percentage has decreased to 10% among the boys and 14.7% among the girls. Almost any reason may be given for the preference of any particular member of the family, but it is generally some personal and emotional reason and almost never a logical one.

Many children, when they relinquish the family ideal, replace it by some figure they have come to know through history. In the children of the city schools, the per cent interested in some historical figure rises from 3% in the fourth year to 30.3% in the eighth year. Here the chief reasons given for the choice of a hero are his strength, his power, his fame, his genius, etc.

The religious character is another common ideal, whether it be Jesus, God, Mary, some saint, or any one of the Old Testament characters. These become ideals, the children say, because of their holiness, piety, freedom from sin, wisdom, power, or capacity to endure martyrdom.

When it comes to the question of the calling they would like to follow, some of the children can give no reason for their choice, while many give irrelevant or very naïve ones. A few give some religious motive, and still fewer can assign some rational explanation for their desires.

War stories, religious stories, and folk-tales, in the order named, head the list of preferred readings. Instructive literature is at the foot of the list.

The reasons given for the choice of the dearest friend score most heavily in the following order: gratitude, customary association, sympathetic understanding, general characteristics, character traits, appearance. Less than 1% of the children admit choosing an intimate friend because of difference of sex.

While the information thus collected is of undoubted interest to students of child psychology, it is evident that there are certain limitations imposed by the method. The choices made are probably entirely valid, but the reasons assigned are in every case entirely superficial, since the child cannot have any knowledge of the unconscious factors which undoubtedly play the largest part in the selection of a personal ideal or profession, as well as in all the decisions of life.

Dr. Guradze's little pamphlet is a very good reference source for the German statistics on birthrate, illegitimate births, infant mortality, etc. From these statistics the author concludes that the illegitimacy of the child is correlated with a high rate of infant mortality. He also discusses the statistical data from the viewpoint of the social classes involved, the death rate in the different months of the year, etc.

PHYLLIS M. BLANCHARD.

BOOK NOTES

Growth During School Age. By PAUL GODIN (Tr. by SAMUEL L. EBY). Boston, Richard G. Badger, 1920. 268 p.

This book has been translated from the French in order to introduce to America a man who has studied scientific education for nearly forty years, and also with the design of directing greater attention to the contributions to the theory and practice of education in France. The translator believes that French educational practice has not been sufficiently appreciated in America. He calls attention to the fact that Dr. Godin's work is a model of scientific procedure in educational measurements and also a valuable contribution to adolescence. The second part of the book discusses the practical application to school room practice of the laws and principles stated previously. Part I, Analysis of Growth, tells us why growth should have a place among subjects of scientific education, its method of study, discusses the metrical proportions of the body from birth to adult age, the influences that act upon growth, puberty, and the laws of growth. Part II, Applications to Education and Pedagogy, discusses unequal growth and its causes, growth by great alternations, individualization of school furniture, control of physical education by the auxanological method, asymmetry, measurements in accordance with individual records, determination of "somatic individuality." There are sixteen plates that add much to the value of the book.

The American Red Cross in the Great War. By HENRY P. DAVISON. N. Y., The MacMillan Co., 1920. 302 p.

This book sets forth the scope, character, and effect of the work of the American Red Cross during the Great War. When it closed, there were thirty million Americans enrolled in its organization, mostly at home but some of whom were in foreign fields. There were many stories of special sacrifice and devotion, some of which are here given. The files of the War Council have been freely used, and the book contains a number of interesting illustrations. The twenty-two chapters treat of the origin of the work, comradeship, work for the soldier at home, in the navy, mobilizing children, the disabled soldier, Switzerland the central station, work in Belgium, Italy, Great Britain, Rumania, etc. This appears to be by far the best and most comprehensive account we have had or perhaps shall have of this great work.

Education: Its Data and First Principles. By T. PERCY NUNN. Lond., Longmans, Green and Co., 1920. 224 p.

This book is addressed to two classes of readers: to professional students it offers a preliminary survey of the whole field of educational theory and practice, while it also addresses a wider public, whose increased interest is the mainspring of social progress. The general purpose of the author is to reassert the claim of individuality to be regarded as the supreme educational end and to protect that ideal against both the misprision of its critics and the incautious advocacy of some of its friends. A courageous pursuit of this principle is above all things necessary in our civilization. The fifteen chapters of the book, therefore, deal with such subjects as The Aim of Education, Individuality, The Will to Live, The Living Past, Play and the "Play Way," Nature and Nurture, Instinct, Growth of the Self, The Mechanism of Knowledge and Action.

The Teaching of Modern Foreign Languages in School and University. By H. G. Atkins and H. L. Hutton. Lond., Longmans, Green and Co., 1920. 246 p.

The editor of this book, which is in the Modern Educator's Library series, and his colleagues have in view the need of young teachers and of those training to be teachers. But since the school and the schoolmaster are not the sole factors in the educative process, educators in general may also find help here.

The book is divided into two parts: The School and The University. The first discusses the place of modern languages in general education, organization, methods, grammar, and history. Part II, The University, after an historical introduction, deals with the staff, organization, training of secondary teachers, scholarships and prizes, and civil service examinations.

Trends of School Costs. By W. Randolph Burgess. N. Y., Russell Sage Foundation, 1920. 142 p.

This treats of the mounting cost of education, teachers' salaries and their relation to the cost of living and to the salaries of other workers, the trend of building costs, doubling the school budget, and sources of income. It is a model of condensation and concise statement.

A Day Continuation School at Work. Ed. by W. J. Wray and R. W. Ferguson. Lond., Longmans, Green and Co., 1920. 212 p.

No attempt is here made to cover the whole question of continued education; the book deals with two day continuation schools actually at work. Rural schools and their peculiar difficulties are not included. Since this book is a collection of twelve papers by different contributors no uniformity of style or treatment has been aimed at or attained. Indeed, there is considerable divergence of view. The main point is that each contribution is the result of personal experience. Both girls' and boys' day continuation schools are described, problems of class teaching in boys' schools discussed, physical training in a girls' school, arts and crafts, literature as mental culture, coördination of school and works, the employer's part in continuation school work, etc.

Projects in Action English. By Fannie O. Johansen. Bost., Badger, 1920. 207 p.

In English composition, the author says, the teacher must guide the students through a period of oral preparation, writing down their thoughts, and correction. As to subject matter, there are two sources, one the direct in which the pupil may draw upon his own experience or creative imagination, and the indirect in which the pupil obtains his knowledge from class teaching or general or specific reading. Composition, whether oral and written, should express ideas that are original and spontaneous. Action is the basis for the test of sentence-structure, and to be effective it must be given without lengthy planning. The actions must be such as would be a credit to an educational institution. Thus, e.g., those tending to burglary should be discouraged.

The first part of the book deals with oral projects, arranged with reference to a junior high school; the second is devoted to written projects; while Part III gives samples of the compositions of some of the author's pupils.

The Chalif Textbook of Dancing. (Book III—Greek Dancing). By LOUIS H. CHALIF. 1920, Pub. by the Author. 226 p.

The author of this work came to this country a dozen or more years ago, almost unknown but with remarkable European experience in ballet and other kinds of dancing. After some hardships he succeeded in establishing his now well-known normal school of dancing, and has given himself a high position in this art. Years ago he made a special study in the various countries of Europe of folk-dancing and has written several volumes illustrating it. In this book we have an effort to find the science of the art of Greek dancing and its pedagogy. He here considers dancing simply as an art, although urging that it also gives mental and physical health.

The Child Vision. By DOROTHY TUDOR OWEN. Manchester, The University Press, 1920. 180 p.

This is a study in mental development and expression, and is concerned with the function and scope of composition, direct vision, imagery, oral work, writing, compression and expansion, essays, etc. There are four colored illustrations.

La Filosofia de lo Inexpresable Bosquejo de una Interpretacion y una Critica de la Filosofia de Bergson. By PEDRO S. ZULEN. Lima, Sanmarti y Cia., 1920.

El Desarrollo Fisico del Escolar Cubano Sus Curvas Normales del Crecimiento. By GEORGES ROUMA. Habana, Morlon, 1920. 133 p.

An Index Number for State School Systems. By LEONARD P. AYRES. N. Y., Russell Sage Foundation, 1920. 70 p.

This is a most convenient little handbook for those interested in these tables and indexes. It contains concise directions for constructing, applying, and interpreting the method to different data.

The Class-Room Republic. By ERNEST A. CRADDOCK. Lond., Black, 1920. 80 p.

This little book attempts to explain and describe two educational experiments which the author tried because of his belief in the need of reform in teaching. He then proceeds to discuss the advantages of the system he advocates, some objections to it, "The School Republic," and competitive work in the school republic.

The Manchester Grammar School, 1515-1915. By ALFRED A. MUMFORD. Lond., Longmans, Green and Co., 1919. 563 p.

This ponderous tome gives us a very fascinating sketch of the development of one of the old English secondary schools. It is a regional study of the advancement of learning in Manchester since the Reformation. It is evidently a work of love, and certainly of great patience and much erudition, which no review could do justice to.

Practical Chemistry. By N. Henry Black and James Bryant Conant. N. Y., The MacMillan Co., 1920. 474 p.

This is an attempt to combine an introductory course in chemistry with a sense of its usefulness at every stage.

Fundamentals of High-School Mathematics. By H. O. Rugg and J. R. Clark. Yonkers, World Book Co., 1919. 368 p.

This is a textbook designed to follow arithmetic, and its method is synthetic.

The Individual and the Curriculum: Experiments in Adaptation. Publ. by Francis W. Parker School. Chic., 1920. 158 p.

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METABOLISM IN CHILDHOOD

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What is the physical difference between a child and an adult? The answer of the naïve observer may well be that the child is small and the adult is large. From the scientific point of view also this is really one of the differences of fundamental significance. It is important, not merely because of the difference in the mechanical proportions of a small body as compared with a large body, but still more significant because the response to stimulation is different in a small body from what it is in a large body. In other words, the smallness of the child's body is significant because it is one of the conditions of greater metabolism in the young. The fact of this greater metabolism is well known. The reason for it is in dispute.

Unfortunately few studies have been made of the metabolism in children. The old investigations by Magnus-Levy and Falk indicated that the basal metabolism in infancy is low, that it is high in childhood, and low again after the onset of old age. Harris and Benedict conclude that metabolism decreases throughout adult life. One of the objects of the investigation of basal metabolism at the Carnegie nutrition laboratory has been the determination of the changes that take place throughout the entire period of life. But in the opinion of Harris and Benedict the time is not yet ripe to chart these changes. In general form, however, Dubois has attempted to present the curve of metabolism. He describes this as follows (17, p. 109-110):

"During the first few weeks of life the metabolism is very low, after which it rises rapidly until at the end of the first year it is 50 per cent above the adult level. The curve reaches its acme in the almost unexplored period between two and six years and then falls fairly rapidly until the age of twenty years. After this the decrease is extremely gradual."

One of the facts brought out clearly by the various studies of metabolism in relation to age, is that throughout the whole range of adult life the heat production of the individual decreases. This is thought to be due to definite and progressive physiological changes in the tissues of the organism with increasing age. We refer to this in general terms as due to the greater vitality of the young; but this is a part of the great mystery of growth and development. We recognize the fact, but we cannot explain it. We can, however, inquire in regard to the conditions of this greater metabolism. There are two theories: first, is the theory of Camerer(15) and Rubner(32) and the view that has generally been accepted.

These writers maintain that the greater metabolism in the young is conditioned by the relatively greater skin surface of the small body of the child as compared with the large body of the adult, and the greater part of the metabolism is necessary to supply the loss of heat radiated from the surface of the body. Camerer starts with the fact that the surface of a small body is much greater in proportion to its weight and its content than that of a large body. If we take, for example, two bullets of lead, one of 2 centimeters in diameter, the other of 4 centimeters in diameter, and attempt to maintain them at the same temperature, more heat is required to do this in case of the small one per unit of weight than in case of the larger one, because the heat radiated from a body is proportional to its surface and not to its content or its weight; and the small body on account of its relatively larger surface loses heat more rapidly than the large body.

In like manner the small body of a child has relatively larger surface in proportion to its mass than the large body of the adult. There is greater loss of heat by radiation, and a greater amount of food must be taken and transformed into heat in order to compensate for this loss. Hence children, for each kilogram of body weight, produce a greater amount of energy than adults. The same is true of a dwarf and of small animals as compared with large. Thus, according to Camerer, the amount of nourishment required depends chiefly on the amount of surface of the child's body. And the child needs relatively more food than the adult because he is small.

The views held by Camerer and Rubner are similar, but Rubner has worked his out with great elaboration and formulated his stereometric law to the effect that the expenditure of energy is constant for each unit of body surface. This famous law is substantially as follows: Warm blooded animals, in order to keep their body temperature constant, must produce a constant amount of body heat for each unit of body surface. Therefore the metabolism must be constant for each surface unit. As much heat must be produced in a given period of time as is lost by the surface; or, as Schlossman and Camerer express it, the essential part of the metabolism serves for renewing the heat that is lost by radiation. As Rubner (32, p. 196) formulates it, metabolism is directly proportional to the surface area of the body; and for each unit of skin surface large animals and small animals, elephant, lion, or mouse, have the same heat production. This stereometric law (32, p. 148) seems to be universal among mammals. For every species, it is maintained, definite figures for the heat production can be established for each square meter of body surface. These are constant for definite physiological conditions—rest, temperature, nourishment, and normal physical condition. Thus metabolism is determined.

We may well be suspicious of any mechanical theory of the human organism. The body is not a mechanical object like a stove whose function is merely to produce a certain amount of heat and incidentally boil the water in a tea-kettle, but rather it is a mechanism for producing complex organic functions with which its metabolism is necessarily correlated.

Harris and Benedict(20) have made a thorough-going study and critique of the body surface law, and have shown that by the Meeh formula the body weight gives practically as good a basis for prediction of heat production as the body surface. They point out many defects in the law, among others the following: It does not hold under widely varying states of nutrition. For the fasting individual the body surface law does not hold. It does not hold in certain pathological conditions. Again heat loss does not occur exclusively through the skin. A considerable part of the total heat generated is given off by the lungs and by the vaporization of water. "Finally," they conclude, (20, p. 200) "in view of the facts that (a) the equations developed in this volume and the convenient tables which have been provided for the prediction of the basal metabolism of the individual from stature, weight, and age deprive the 'body-surface law' of its unique practical significance, and that (b) the evidence of an actual physiological nexus between body-surface area and metabolism is altogether inconclusive, it seems to us that the 'body-surface law,' as far as its supposed application to the human individual is concerned, must play a very minor rôle indeed in future physiological discussions."

An extended study has been made also by Pütter(30) of the active surface of physical organs in relation to function. The outcome of this investigation is to show that in case of mammals the development of the body surface is not the determining factor for the intensity of the metabolism.

In the present condition of our knowledge of metabolism we can get a very good orientation in regard to the total exchange of an animal if we merely have sufficient data in regard to its food. Putter gives an estimate of this on the basis of data furnished in Kellner's *Lehrbuch* and according to König for carnivorous animals. In this case the food is practically completely digested except the bones. Pütter has estimated this for a lion weighing 200 kilograms and a sea-lion weighing 110 kilograms, an ox, a horse, an elephant, a camel, and one or two other animals; and he presents a table comparing these results with those for the small mammals like the mouse, rat, cat, sheep, and the like.

The exchange for the mammals mentioned in relation to the body surface shows a difference of about 6.65 times, hence one can not at least speak of any constant of exchange. The two water mammals which for unity of body surface show almost exactly the same exchange, 3,400 and 3,500 calories, exceed the relative exchange in the case of man more than double, and, finally, the elephant and camel per unit of surface exceed that of man three to four times. Pütter (30, p. 201) makes certain corrections for differences in the bodily shape in these animals as compared with man, but these are not great; and hence he concludes that the development of the body surface is not the determining factor for the intensity of metabolism in mammals.

Rubner's investigations were most painstaking and extended. They represent a kind of pioneer work that is especially important. The fate, however, of the investigator in a new field is likely to be that many of his results are shown by later investigation to be erroneous. The significance of the pioneer work is that it leads to further investigation. Judging from this point of view the studies of Rubner have been of prime importance. From the point of view, however, of the larger problem, they are inevitably superficial and in part the results are erroneous.

This stereometric law of Camerer and Rubner has played a tremendous rôle in physiology and the study of metabolism. The difficulties connected with it and the defects likely to be connected with it, have been discussed at length by Harris and Benedict in their new book, " A Biometric Study of Basal Metabolism in Man."(20)

The fundamental defect of this so called law, however, is not its inadequacy as a statement of the mechanical facts, but still more serious, its failure to represent the vital and significant facts of a growing and developing and functioning organism. Strangely enough this defect seems to have received little attention from physiologists and special students of metabolism. It will appear from a view of the other theory.

The other theory takes account of the common characteristic of the child and the adult noted at the outset, namely, that both are mechanisms for converting stimuli into reactions, and puts the emphasis on function. Professor Kassowitz has developed this, although it is based, I understand, on earlier work by Pflüger. Rather strangely this theory seems to be little known and the name of Kassowitz is seldom quoted by American students of metabolism. This neglect, I fancy, may be due to the fact that Kassowitz's theory as regards the greater metabolism in the child, appeared in the *Jahrbuch für Kinderheilkunde* (22) and the *Zeitschrift für Kinderheilkunde* (23), and, did not, so far as I am aware, appear in the Journals of Physiology. It is, perhaps, an illustration of the way child hygiene has been neglected.

According to this theory the reason for the greater metabolism in the young is the fact that in a small body the nerve paths are shorter and the response to stimulation quicker. All the vital processes go on more rapidly; and heat is a by-product of this functional activity. The food taken into the body is used to build up protoplasm; and under the influence of varied stimuli this protoplasm breaks down producing the energy which functions our reactions. The significance of the smallness of the child's body as compared with that of the adult lies chiefly in the fact that in a small body the reflex arcs have shorter members and reaction follows stimulus more quickly. This brings us to the heart of the theory of Kassowitz, and we may approach it from the psychological point of view.

All students of psychology and physiology are familiar with the following experiment. Place a drop of acid on the thigh of a decapitated frog and immediately the muscles of the frog's leg contract and the leg is lifted to brush off the irritating stimulus. This simple reflex act is the type of all our activity. First, a receptor organ and an incoming nervous current along an afferent nerve; second, an adjustor and more or less complicated central process; and then third, a discharge along an efferent nerve to inervate a muscle or gland, an effector organ. The stimulus is an essential condition of the reaction. In the case of continuous movements, according to the common view, the movement itself, or the kinaesthetic sensation if you prefer, acts as a stimulus for the succeeding movement, and thus continued movements are kept up automatically. According to Prof. Kassowitz, not only is this true of our ordinary automatic movements but it is true also of those alternating or rythmical movements so important in the body, the movements of the heart and of respiration, as well as the movements of locomotion and the like. The systole and dyastole of the heart, inspiration and expiration, the raising and lowering of the wings of the birds or the fins of the fish, the contraction and extension of the limbs, follow each other in an unbroken and long continued sequence. This is not the whole story; but it is essentially true and it is the view of Kassowitz. That is, the supposed automatic movements are to be referred back to reflexes for which the stimuli are found in kinaesthetic sensations from the muscles and the parts moved by them.

In simpler words, each movement furnishes the stimulus for the next movement. Thus the continuous movements of an automatic act like walking consist of a series of reflex arcs, according to the view now generally accepted by physiologists. In like manner arise in case of the heart and respiration those movements which continue throughout the whole of life, and each of these reflex arcs has of course its centripetal and centrifugal arm whose length is naturally dependent on the size of the animals. But since we know that the velocity of the nervous processes is the same in small animals and in large, the interval between the separate phases of a similar movement in the case of large animals with longer nerve paths must be correspondingly greater than in the case of smaller ones. This deduction from the theory of the reflex arc is corroborated by the facts observed in regard to the rapidity of fundamental movements in the large animals as compared with small ones.

It is interesting how frequently in the various sciences we have to go back to the great discoveries of Helmholtz. About the middle of the last century when Helmholtz was studying the rate of the nervous current in the frog's nerve, the great Johannes Müller was teaching his students that the rate of the nervous impulse was infinitesimal—*unendlich klein, und unmessbar*.

The young Helmholtz, however, demonstrated that the rate of the nervous impulse is relatively slow, namely, in the frog about 30 meters a second, and later showed that for warm blooded animals it is about 34 meters a second, that is, about the rate of an express train. In man the rate of the nerve current is about that of the fastest express train, 100 meters or more a second. Thus we find this striking difference as regards these movements; in small animals they follow each other more quickly, in large animals more slowly. The heart of the elephant beats twenty-five to twenty-eight times in a minute, that of the adult cat 130 to 140 times a minute. The heart of the newborn child contracts about 130 times a minute and that of a child of six about 100 times, that of an adult about 70 times. Much the same is true of respiration. In the case of the newborn child the respiration is about 35 per minute; at the age of six it is perhaps 25 per minute; in the case of the adult about 13 when lying down, and 22 when standing, with of course great individual variations. Again in the case of the smaller mammals and birds the number of contractions of the heart are much more frequent, and there is a similar difference between the movements of the wings in large animals and in smaller animals, with the slow movements of the large birds on the one hand, and the rapid movements of the wings of the housefly on the other, 360 times in a second.

Miss Buchanan(12) has given tables showing the estimated frequency of the heart beat for different animals. The number of determinations has been small, but while the exact numbers given cannot be taken as very reliable, the difference between the heart beat in large animals and small animals is obvious. Some of the figures in her table for mammals are as follows, the number representing in each case the average when the animal is at rest. For the mouse, 700 per minute; for the guinea pig, 300; cat, 160; rabbit, 205; medium sized dog, 120; large dog, 85; sheep, 75; ox, 48; horse, 37.

In a word then this is the theory. Both large animals and small animals are machines for converting stimuli into reactions. The smaller animals with shorter nerve paths react to stimuli more quickly; and this, according to Kassowitz, is the chief cause of their relatively greater expenditure of energy and metabolism. And heat and energy according to Kassowitz are caused by the breaking down of the complex protoplasm molecules on occasion of stimuli from the afferent nerves.

Kassowitz has formulated this view as follows: small animals do not sustain more oxidation per unit of weight than larger ones because on account of their relatively greater body surface they lose more heat than the latter, but for the reason that their alternating movements, whose later phases are always produced reflexly by the earlier ones, on account of the shorter nerve paths more quickly succeed each other. The same relation prevails in case of cold-blooded animals, where an increased combustion for the sake of satisfying the need of heat is manifestly excluded.

By the fact that the ratio of metabolism between large and small individuals in case of cold blooded animals is the same as it is in the case of warm blooded animals, the teleological significance of the increased production of heat in the smaller individual is disproved.

Against this causal explanation that by the shorter reflex paths the alternating movements including the continuously active movements of the heart and respiration which produce heat repeat themselves in a period of time more often, and consequently more heat must be created by them, there cannot be raised any serious objection. Examples are plenty.

That the metabolism is correlated with the pulse rate there is apparently good evidence.

Benedict and Cathcart have made many tests which show that after muscular work there is increased pulse rate and increased metabolism. They say (6, p. 172):

> "The intimate relationship between the pulse-rate and the metabolism is strikingly emphasized by the distinct tendency shown for the pulse-rate to assume a much higher level after work than before—a level that is roughly approximate to the increase in the total metabolism. The respiration-rate, on the other hand, does not alter greatly. Since they were reported primarily to show the influence of muscular activity on the pulse-rate, the observations of Pembrey are of interest here. One of his subjects before the test had a pulse-rate of 70; immediately after running 2 miles, the pulse-rate was found to be 164; 10 minutes later, 128; 30 minutes later, 100; and 60 minutes later, 82. Another subject had a pulse-rate before running of 66; immediately after running the 2 miles, the pulse-rate was 140; after 2 minutes, 120; after 33 minutes, 106 after 77 minutes, 84; and 107 minutes afterwards, 74. A second test with the same subject showed a pulse-rate before running of 56; immediately after the run, 136; 15 minutes afterwards, 104; 45 minutes afterwards, 88; and 75 minutes after, 86. In all of these observations, it will be seen that the pulse-rate remained at a considerably higher level after the exercise than the resting value obtained before the run."

There is evidence also that, in general, the metabolism is correlated with the muscular activity. Benedict and Carpenter (5, p. 243) have made experiments which show that the ordinary processes of sitting, standing, walking and general muscular exercise condition metabolism.

> "When the subject is quietly seated in a chair, the metabolism is invariably somewhat higher than when he is lying on a bed asleep. If a subject is trained to so regulate the muscular tension by his will as to reduce it to the minimum, the differences in the carbon-dioxide excretion during such muscular relaxation when lying down awake and when asleep are not measurable. On the other hand, sitting up calls for a different readjustment of the muscular system with variations in the tonus, and the sitting posture does not permit of as com-

> plete a relaxation of muscular tension as does lying down. Standing requires a still further readjustment of muscular tension and the variations in metabolism between sitting and standing are of unusual interest."

Benedict and Carpenter(5) also made experiments to determine the difference between standing and sitting upon metabolism. Five experiments were made in which the subject sat from 2 to 4 hours and immediately afterwards stood for 2 to 3 hours, and the four factors of the grosser metabolism were measured.

> "As might have been expected, there is an increase in practically all the experiments during the standing period, although singularly enough with the subject H.R.D., there was a lowered carbon-dioxide exhalation and water vaporization and a decreased oxygen absorption. On the other hand, there was a noticeable increase in the heat production." (5, p. 243.)

Thus the significance of the functional activity of the organism in the production of heat has been shown incidentally by the studies of metabolism. The more recent work in the respiration chamber has shown that such apparently trivial matters as writing, telephoning, moving about, even the sitting posture in contrast with the reclining position or the slight exertion of raising the hand to the mouth, may have a reasonable influence on heat production.

It must at least be admitted that the theory of Kassowitz as modified by Benedict's results is more in harmony with modern physiological and psychological teaching, placing, as it does, the emphasis upon function, and the actual facts as we find them rather than upon teleological reasons.

Involved in this theory is a more rational view of the way in which heat and energy are produced. According to this all forms of nutritive material, protein, sugar, fat, etc., are assimilated and always utilized for the synthesis of highly complex protoplasm molecules, and these, on account of their extreme chemical instability, are ready to be split up at the slightest impact; in this way energy is produced, and along with the dynamic effects heat also must be produced (22, p. 555).

We do know that protoplasm is built up by food and reserve material, for example, in the development of the organism from a tiny germ. But on the other hand we have no satisfactory proof that food, protein, fat, and sugar can be burned up in the living organism and changed into CO_2 and water without being first assimilated, that is being first utilized in the building up of living protoplasm.

Only one thing is certain, says Kassowitz (22, p. 575), namely, that neither the most accurate investigation of the finest histological structure of the muscle fiber, nor of the most industrious testing of its physiological functions in every direction by the most refined methods of experimentation have given even the most remote evidence of the transformation of heat into mechanical work in the human body.

Not only the muscles but also the glands and all the living parts of the body react to stimuli, produce combustion products and heat in a ratio proportional to the intensity of the stimuli and the amount of the functions produced. The oxidation does not occur in order that heat may be transformed into work, but because every stimulus and every disintegration of protoplasm occasioned by it involves *eo ipso* oxidation processes.

According to the view of Kassowitz heat is always an unavoidable by-product of all the functions that go on with the building up and breaking down of protoplasm. It is natural to presuppose that the share of the voluntary muscles in the processes of oxidation involved in the production of heat is very considerable. This has been shown also by numerous facts of experience. There is a reduction of the use of oxygen of more than ⅓ by the use of curare, of perhaps 30% by sleep; and experiments by Specht and von Löwy have shown that the increase of the elimination of carbon-dioxide due to cold does not occur until the trembling or shaking and muscle tension occur. Thus it is obvious that an animal who makes per minute more respirations and has per minute more pulse beats than another will also in a condition of rest expire more carbon-dioxide and correspondingly create more heat than the other. This is shown in experiments in the case of smaller animals in comparison to large ones belonging to the same species and in case of young animals not yet developed in comparison to older and developed animals of the same species.

Krogh (25, p. 415) has made a study of the capillaries and oxygen pressure in the muscle and the differences in the gas exchange between cold blooded and warm blooded animals and between warm blooded animals of different size, and finds that "The number of capillaries per square mm. of the transverse section of striated muscle appears to be a function of the intensity of the metabolism, being higher in small mammals than in larger forms:"

With the view of Camerer and his school, on the other hand, is very naturally associated a mechanical view of the production of heat. 1. Heat, according to them, is produced by the combustion of food in the body to supply the loss of heat by irradiation from the surface of the body; the larger part of it for this purpose. 2. Heat is produced to be transformed into energy for work. Camerer takes also a mechanical view of the method by which power is furnished to the muscle machine. He maintains that the material which is burned up in the active muscle in some mechanical and not yet understood manner brings about a hardening and contraction of the muscle by which it overcomes resistance and does work.

The popular conception of this view is apt to be that heat and energy are produced in the human body in the same way as in engines that supply the power for mechanical work. In the carburetor of the automobile tiny drops of gasoline are picked up, mixed with air, and exploded in the engine, producing the power that is utilized.

The popular idea is expressed by a physician in a recent article on the physiology of the child as follows:

" In the muscular exertion of running, energy is liberated by the combustion of fuel in the muscles concerned in the movement, in exactly the same way that coal is consumed by an engine which is hauling a train."[1]

The fascinating simplicity of this mechanical theory may well make us suspicious that it does not tell the whole story. Let us look at the subject again from the point of view of stimulation and response. This calls attention at once to the fact that the human organism is not a clever machine for producing mechanical responses to definite mechanical changes in the fuel supply, but a complex living organism, continually subject to the changes of metabolism and in process of growth and development.

We do not have evidence of any such mechanical process in the human body. On the contrary, the fuel is built up into highly complex protoplasm molecules, and on occasion of stimulation these are broken down in the response, and heat is produced as a by-product. As Sherrington (33) has said:

" Food is not fuel in the ordinary sense. The fuel of the gas engine becomes no part of the fabric of the machine, and is not built into it, repairing wear and tear. But food entering the body seems to be in large measure vivified before its energy is taken. It is built up into the living fabric of the body. In that sense the creation of living matter from dead—a literal though not the technical heterogenesis—is going on today, and in each one of us."

In other words the food utilized by the body is assimilated, built up into protoplasm, and then broken down on occasion of physiological stimulation. And heat is a by-product of these vital processes. Sherrington and a few other writers have expressed this view correctly. Hutchinson, in his "Dietetics," for example, expresses it as follows:

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[1] Pritchard, Eric: The physiology of the child. *Child Study,* 1909, Vol. 2, No. 1, p. 7.

> "It would seem, indeed, to be to a large extent a matter of indifference to the cells of the *body* whether they draw their supplies of energy from proteid, albuminoids, carbohydrate, or fat, although probably they can get it more rapidly and easily from the three former than from the latter. We now know also that bodily heat is not a thing apart and requiring to be provided for by itself, but that it is an inevitable accompaniment of cell life. Life and heat are inseparable, and in fulfilling its other functions in the body a cell cannot help producing heat also. Heat, in fact, is a by-product of functional activity. Hence it is a matter of indifference as far as the cells of the body are concerned—not necessarily, be it remembered, as far as concerns the digestive organ—whether we feed a man on egg-white, gelatin, butter, or sugar, always supposing that these are supplied in the proportion of their dynamic equivalents."

The teleological explanation of the creation of heat in the living organism is not only inadequate and unfruitful, but it fails because it does not hold in the whole wide field of the organic world. It is true that it seems to have a justification in the case of warm blooded animals who maintain their body temperature approximately constant under the most varying external and internal conditions, although this is not strictly true. But in the case of cold blooded animals and in case of all plants, whose temperature differs only a fraction of a degree from that of their surroundings, the basis for the mechanical heat theory fails altogether; for these organisms have no means of retaining the heat created by their vital processes, and lack also the ability to increase their heat production in case of lower external temperature or to reduce it in the case of higher external temperature.

Conditions Determining the Greater Metabolism in Childhood[2]

To show more concretely the complexity of our problem we may now summarize the factors already mentioned and certain other conditions of the greater metabolism in children.

First is growth. The growing organism must have a greater amount of protein for the building up of new tissue, and thus growth is one factor. This, however, in itself, is not the prime factor in conditioning the greater metabolism. It has far less influence than is usually supposed. The child's rate of growth is very slow, the daily increase in the first month of life being only about 1%and in the 12th month only .1 of one per cent of the body weight. However conflicting the theories mentioned, it should be noted that both agree that the metabolism required for growth is of secondary significance, that the greater metabolism is correlated in some way with the smallness of the child's body, and that by this fact is determined the greater relative amount of nutrition required.

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[2] For the general factors affecting metabolism, see Benedict (3a).

Second. Again there is greater metabolism in the young because in the growing organism there is a greater amount of protoplasm and a smaller amount of metaplasm. By protoplasm is meant the living, assimilating, irritable protoplasm in which the processes of building up and breaking down, of metabolism, occur; and, on the other hand, by metaplasm, the parts which constitute the form of the organism and the reserve material. The latter are developed from the living protoplasm; and we should not think of them as by any means free from metabolism. Recent investigations by McCrudden have shown that in the bone, for example, processes of metabolism are continually going on, new bone is being built up, old bone is being broken down; and the bony structure, from a physiological point of view, is by no means static, but the seat of continuous processes of anabolism and katabolism. It is true, however, that metabolism in such tissue, which has been called metaplasm, goes on more slowly. Hence the relatively large amount of protoplasm in the child is significant; hence this preponderance of protoplasm in the young is the condition of a much more active metabolism quite apart from the size of the organism. The conclusion of Benedict and Talbot is in agreement with this view, as follows: "We believe that our evidence points strongly and conclusively to the fact that the active mass of protoplasmic tissue determines the fundamental metabolism. The absence as yet of a direct mathematical measure of the proportion of active protoplasmic tissue does not, we believe, in any wise affect the convincing nature of our evidence."

Third. The surface of the internal organs. The question naturally arises why may not the surface of the internal organs which represent largely the active protoplasm be significant and even the surface of the cell body as well. Pütter, in his remarkable investigations, has studied the active or functioning surface of the different bodily organs, and shown a relation between the functioning surface of an organ and the physiological work of the organ. In case of the kidneys, for example, it is not the mass or the weight of the kidneys that is significant, but the functioning surface. The urine secreted by the kidneys in the infant is relatively nearly two and one-half times greater than that in the adult for the same unit of weight; and for different animals there are great relative differences; but for the active surface of the kidneys the relative functional value is practically the same for different animals.

His studies lead him to the conclusion that the metabolism per unit of the lung surface is a constant value and that this is the significant thing. This surface, however, does not grow proportionately to the body surface.

If we could take the active surface of an organ as a measure of its importance in the total metabolism of the body, then a new basis for the division of the quantitative functioning of the different organs would be obtained. In order to obtain comparable values the development of the surface of the capillary system would be determinative, out of which, Pütter (30, p. 213) holds, an inference in regard to the share of the separate organs in the exchange of the intermediary metabolic products could be obtained.

All this is in harmony with the conclusion made by Benedict that the amount of active protoplasm in the body is the prime condition in determining the amount of metabolism.

Of course we should consider the individual cells as well as the organs of the body. The studies of the cell have shown that in the young there is a relatively larger nucleus and in the adult with increasing age a greater amount of protoplasm. Minot indeed has made this increase of the protoplasm the essential condition in producing old age. This greater nucleus in the cells of the young is apparently an important factor, and may modify our view.

Fourth. The larger skin surface, probably in a minor degree, is a condition of the greater metabolism in the young, but not in the sense held by Camerer and Rubner. As Benedict and Talbot(11) put it:

" The basal metabolism as we have outlined above, can not in any wise be considered a direct function of the body-weight and the body-surface, and particularly has no relationship with body-surface on the basis of the law of cooling bodies."

In one way at least the larger skin surface in the child is sometimes a factor in conditioning greater metabolism from the fact that on the relatively larger skin surface of the child's body relatively more numerous skin vessels are contracted by the stimulus of cold, and also more skin muscle fibres are made to contract and produce heat than in the relatively less skin surface of the adult. This is only exceptionally a factor, since the skin of the child and especially that of the infant under ordinary circumstances is seldom long exposed to low temperatures.

Fifth. Another condition of this greater metabolism is the fact that in a small organism the reflex arcs are shorter, and the fundamental processes of the heart, respiration, and the general movements of the body go on more rapidly.

As already noted the heart of the newborn child contracts about 130 times a minute; that of an adult, about 70 times per minute.

The investigations of a large number of children made by Benedict and Talbot show the correlation between the pulse rate and the metabolism. While, as yet, so far as I am aware, there is no direct experimental evidence to show that an individual who has constantly a high pulse rate, has a higher metabolism than an individual with a low pulse rate, it seems natural to make this inquiry, and as regards temporary changes in the pulse rate in the same individual Benedict and Talbot have furnished a large amount of evidence. Hence they make the following conclusion:

> "This evidence of the relationship between the pulse rate and the metabolism, taken in connection with the evidence presented in previous sections of this book, gives an entirely new significance to the pulse-rate, since it may be considered as a very fair index of the metabolism. In other words, an infant having a pulse-rate of 120 at one period of the day and of 150 at another period has unquestionably a greater metabolism in the second period. There is no evidence, however, that a difference in the pulse-rate of any two infants necessarily indicates a proportional difference in the metabolism, even though the infants be of the same weight and age, and the periods of observation of the same length. But it is safe to say that variations in pulse-rate of an infant indicate a similar change in the metabolism." (11, p. 141)
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> "We may state, therefore, that whatever increases the pulse-rate also increases the katabolism, so that when the pulse-rate is elevated by the muscular activity incidental to restlessness, playfulness, laughing, or crying, or pathologically as in fever, we have every evidence that the katabolism is likewise increased and a larger proportion of food material or body substance is being consumed." (11, p. 141.)

Sixth. In young children, as everybody knows, the voluntary activity is much greater. This, then, is one of the chief causes of the greater metabolism in the young. It is perhaps the resultant of several of the other conditions, and this is of course in turn a result of the greater metabolism in the young; but, since, on the other hand, it conditions metabolism, it may well be mentioned as a special factor.

Seventh. The better general muscle tonus in the child and the more intense response to stimulation in the young. This is something we cannot explain, but the special characteristic of youth is the ability to respond more intensely to stimulation. This is involved in what is called the better body tone, or it may be another way of referring to the same thing. In any case it involves greater metabolism. The conclusion of Benedict and Talbot is again in harmony with this position. " It is not to be inferred," they say, " that we believe that the increase in metabolism noted with increased pulse-rate is due exclusively to the mere mechanical work of circulation, as this is far from our belief. We especially wish to emphasize the fact that we look upon pulse-rate as an index of muscle or general tonus in the body and not as referring solely to the work of the heart muscles."

Eighth. One other condition, although indirectly determining metabolism, should not be neglected. No view is adequate which does not include the function which above all others characterizes man, namely, the function of attention and thought. Whether these mental processes are more intense in children than in adults, we do not know. If they should be found more intense in the adult that would be a factor on the other side against the conditions of greater metabolism in the young, or, if, as is not improbable, the processes of attention and the like are found to be more intense in the young, this would be another factor to be added to those already mentioned in accounting for the greater metabolism of the young. Specially significant is the fact that all these mental processes are colored by feeling, and the feelings and emotions are probably more intense or at least less controlled in the young. The recent investigations of the endocrine glands have shown their function undoubtedly correlated with the emotions, and no factor is more significant in regulating metabolism than the functioning of these glands, the thyroid gland especially stimulating to greater metabolism. Thus the statements made by some physiologists that the mental processes affect metabolism only slightly, are true only in a very narrow use of the words, i. e., so far as metabolism of the brain is concerned. In actual life the mental processes, so often tinged with emotion, are bound to be distinctly significant in stimulating to greater metabolism through the action of the thyroid and adrenal glands, and the correlated muscular activity. It is significant that the rather intense emotional life at about the age of 5 to 7 and again at puberty seems correlated with higher metabolism.

Recent investigators are just beginning to find concrete evidence of the way these mental processes affect metabolism. Benedict and Carpenter find that when a subject can by exercise of his will, relax his muscles, then the metabolism while at rest is practically no greater than when quietly asleep; and Dodge, working in Benedict's laboratory, has recognized that all processes of attention involve increase in metabolism.

The relative importance of these different factors we cannot determine. With our present knowledge no better statement than that by Benedict can be made. He says: "The total katabolism of the infant is the resultant of two factors: First, the metabolism due to the internal activity incidental to circulation and respiration and the general muscle tonus of the body, i. e., maintenance metabolism; second, the metabolism due to the external muscular activity, which may vary from slight movements of the hand or fingers to violent movements incidental to severe crying." (11, p. 137.)

The inadequate and misleading character of the usual statements in regard to the greater metabolism in the young is obvious by a mere statement of the above facts. Any account of the condition of metabolism in child or adult must include at least the eight conditions here mentioned.

Practical Suggestions

The aim of this paper is not primarily to give concrete instructions in hygiene. A few practical points, however, are obviously emphasized from the point of view here presented, among them the following:

(1) This point of view emphasizes the great differences between the child and the adult. Only recently are physicians and hygienists beginning to recognize that physically the child is a very different creature from the adult. Only one book, that by a Russian author, has treated this subject with any degree of adequacy. Gundobin, in the book referred to, clearly enunciates this modern position as his standpoint. The child, he says, is sharply distinguished from the adult by the anatomical, physiological and chemical pecularities of his organism, and demands special study.

(2) This point of view emphasizes function as the essential condition of health in the organism. There is no such thing as a static or mechanical condition of health.

(3) The great difference between the child and the adult is the difference in functional activity. After the first period of development, culminating somewhere about the third year of life, the child's functional activity is greater than that of the adult. This is correlated with the more active response to stimulation and with higher metabolism.

(4) It suggests what in general the curve of learning probably is for the individual. Apparently Minot's view that the curve of learning is highest at birth, and constantly decreases

throughout life, or, as he puts it, the falling off in the ability to learn and the rate of growth and of senescence are correlated, is untenable. On the contrary, probably the curve of learning is correlated with the curve of metabolism. When that is discovered we may know what the curve of learning is also. Apparently it begins very low, the ability to learn increases up to the second or third year of life, then is very high until perhaps the sixth or seventh year of life, then falls off gradually until there is a decided increase at puberty, then falls off slowly with perhaps slight periodic variations until a point perhaps about 70, although varying greatly with the individual, and then falls off more sharply until the end of life.

(5) Our practical rules in regard to diet have been often erroneous because based on erroneous data. From the present point of view the important rules are the regulation of the amount of food taken according to the physiological age of the individual, and according to the work done by the individual; the man who does hard work requiring, as is well known, some 3,000 calories per day as against a minimum of perhaps 2,000 for the individual who does not work; and a child of six requiring twice as many calories as an adult for each kilogram of body weight or each square meter of body surface.

(6) It emphasizes certain practical points in regard to clothing. The practice of many parents, in muffling young children in clothing, especially when riding in a railway train or the like is the cause of grave discomfort. While the adult is inactive, the child is bound to be active, and the activity of the child, the excess of temperature likely to occur in the car, besides the greater functional activity of the child's organism, produce an amount of heat that must be in many cases torture. The crying and petulance of young children who are thus wrapped up in extra clothing is sufficient evidence in itself of their extreme discomfort.

(7) This point of view emphasizes certain practical suggestions in regard to exercise. The organism of the young child is well fitted for violent exercise for short periods. The heart is relatively small, the arteries relatively large. Cardiac disturbance as a result of violent exercise is quickly compensated for; and, while a child becomes quickly heated by the intensity of its functional activity, instinctively it rests after a short period of violent exercise, and then is ready for further exercise. On the contrary, exercises of endurance which give no opportunity for this cooling of the body after a short period

and which keep up the intense functional activity are liable to be injurious.

(8) Many erroneous and misleading statements have resulted from the commonly accepted view of the necessity for heat production as the main condition in determining metabolism. For example, in case of an individual fasting or on a hunger strike or the like, statements are usually made to the effect that the tissues are used up as fuel; first the superfluous tissues, fat and the like, are burned up, then the more essential bodily tissues; finally the nerve cells of the brain, the citadel of the body itself. On the contrary, the muscular activity of the individual is what destroys the tissues. Even before experimentation this would be fairly obvious merely from the observation of animals in the hibernal sleep and the like. In such cases life is preserved for a long period without serious destruction of tissues because bodily activity is reduced to a minimum.

(9) To increase one's metabolism the method of increasing the amount of nitrogenous food is a poor one. This will have little effect if one remains inactive. To increase the metabolism one must increase one's activity. As Stiles has well stated the case: "The change from fasting to feeding influences the metabolism much less than might be anticipated. It is true that a fasting animal will usually be found to have a low metabolism but this is because it is disposed to quiet. If it is given food, and remains as inactive as before, the increase in oxidation will be very moderate. It is not likely to exceed 20 per cent, whereas mild muscular activity will double the original quantity." (34, p. 337.)

Of course a child or an adult who has to live in a cold house does need an extra amount of food on a cold day, because he will perform an extra amount of work in trying to keep warm. If nothing else, he will shiver, a reflex having as its purpose the protection of the organism from cold. Nature permits one to loaf and starve, or work and eat, but in a cold environment the production of heat is compulsory. If one will not produce it by voluntary exercise of the muscles, one is forced to do so by exercise in the reflex activity of shivering.

While the conditions that determine the greater metabolism in childhood are complex, we can put the hygiene of the whole matter in a nutshell. Children need relatively more food than adults, not merely because their bodies are small, the body surface relatively large, and all the fundamental organic processes go on more rapidly, but also because their response to stimulation is more intense, the general muscle tonus is better, and the amount of protoplasm in their tissues relatively to the metaplasm is greater, and also because they are normally more active. A child's business is two-fold: first, to grow; second, to play and work. One of the greatest handicaps to these prime functions of childhood is malnutrition. Recent studies have shown that this is widespread—among the poor due to lack of food, among the wealthy due often to lack of a proper regimen. The essential need is an abundant supply of suitable food, not a high protein diet, but a great variety with plenty of food and vegetables, and proper habits of eating and exercise.

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A MINIMUM SET OF TENTATIVE PHYSICAL STANDARDS FOR CHILDREN OF SCHOOL AGE

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Introduction

It is a function of scientific procedure in any recognized field of human endeavor, not only to secure and verify accurate information, but also to determine the significance and relationships of ascertained facts; and, for purposes of application, to standardize both the facts themselves and the methods of their use.

Education, especially since it has become so little a perquisite of the home and increasingly a duty of the state, has felt the influence of material and commercial standards, and has realized the need for similar systematized methods that the thousands of children in the public schools might be " handled " with as little waste and friction as possible. The four-fold division advocated by Commenius has been somewhat modified into the kindergarten, elementary, secondary and higher systems, a device both rational and expedient. Within each of these larger groups come the finer divisions into years, grades, terms, semesters, quarters, etc., which represent a still finer classification of students into groups of somewhat uniform accomplishment if not of ability. It must in fairness be admitted that this very standardization in education has not in all cases proved of unmixed blessing or advantage. In many individual experiences gross injustice has been done because of the inflexibility of the " system." The seriousness of this defect is being increasingly recognized, however, and steps toward its reduction, or may one venture to hope, its elimination are being considered and actually introduced.

One of the most outstanding defects in educational procedure is the same in general as the criticism levelled against standardization in industry, viz., the individual human is not given due consideration. The attendant is not a part of the machine, but a human being with hopes and fears, likes and dislikes, ambitions and regrets, who is not belted to the countershaft but whose power and motive comes from within. Nor can the pupil be regarded as so much raw material to be crowded through the educational machine in the hope of turning out a uniform product, up to " standard." Too often the attempt is made to force the student to conform to the schedule and program of the system, whereas the democratic ideal demands that the procedure be adapted to the pupil, that each be supplied with the opportunity, methods and materials best calculated to develop individual superiority subject only to limitations in ability. This, of course, presupposes that the actual conditions, powers and needs of each pupil be ascertained.

One way in which the correction of a too fixed and wrongly based standardization is being sought is by the recognition that grouping by the age or time basis is unsatisfactory and fails to give homogeneity within any of the present age or grade groups. The direction in which greatest progress has been made is that of attempting to ascertain concerning any individual pupil about whom a question as to standing may be raised, not the chronological age, not the grade standing, but rather the mental age or ability. This is based almost exclusively upon a variety of tests of intelligence, since from the very nature of mentality, intelligence is the factor which most readily lends itself to measurement by objective standards.

Another factor concerned with adjustment of the present unsatisfactory system of grading by chronological age or length of time in school is that of physical development. This is important both in its relation to mentality and on its own account.

The relationship between physique and mentality is one upon which great differences of opinion are still held. One can find experimental data supporting practically any attitude which may be suggseted.

Thus Gilbert(58, p. 39), Bagley(6, p. 205) and West(141) found little or no, or in some cases even negative correlation between bodily development and mental ability. Burgerstein (29, p. 38) and others have criticized the above finding on the basis that mentality was judged not by the standing of the pupils but by the estimates of the teachers.

On the other hand Pearson(104, p. 106), Porter(109, p.168), Roberts(116, p. 359), MacDonald(90, p. 1027), Smedley(127), Zirkle(149, p. 9), Pyle(112, p. 39), Boas(19), DeBusk(48, p. 90), Burgerstein(29, p. 39), Crampton(44), Hogue(72), Baldwin(7, p. 82) and Arnold(2, p. 36) are among those who are satisfied that a positive and close correlation exists.

The general practice is to begin the formal education of children at some stated age—in most countries at 6 years—but factors other than and more significant than chronological age are beginning to be considered. To some of these, representing physical development, attention is called in the following pages.

Methods of judging success or progress in school life have been too largely based upon knowledge of subjects included in the prescribed curriculum, but with the new emphasis upon health, the condition of the pupil must be given prominent if not foremost consideration. There seems to be good evidence that at least 20% of the public school pupils are undernourished, and a larger proportion have physical defects the great majority of which are remedial. Military data indicate that many of the disqualifying defects might have been prevented or cured during school life.

It is well recognized that no single factor such as stature, weight, eruption of permanent teeth, development or organization of any muscle group, presence or absence of any secondary sexual characteristics, or in fact any known aspect of an individual may, by itself, be accepted as an infallible index of physiological development. Allowance for individual variations must be made no matter what test is being applied, but when such variations depart sufficiently from the selected standards, and especially when such variations in several tests are in the same direction from the standards, there is rather satisfactory evidence of abnormality, which may be either precocity or retardation.

Thus, should a pupil be found who shows consistently light weight for his age or height, retarded eruption of teeth, weak forearm muscles and poor coordinating power there is a concurrence of evidence of physiological subnormality, which surely deserves recognition in plans for that pupil's health and progress in school and home.

It is not assumed that each pupil's increase in any given measure will show the same regular upward movement as is indicated in the tables or standard; yet it is believed that in case of normal development each child would not differ widely from the corresponding figures. So, wherever possible from the original data, normal deviation has been computed giving the zones within which these deviations might be expected to fall. The practice is to regard any departure beyond these limits as deserving of special attention, especially should such deviation be in the direction of subnormality.

The actual time of the appearance or maturing of any change or quality in a complex organism such as the human body, is not referable to any mere temporal reckoning of the length of life, but is essentially one of development. So it is quite in accord with expectation that there cannot be any definitely marked " time line" but rather a "time zone " within which any physiological transition may be expected to manifest itself. Boas(17, p. 187) has phrased this fact as follows:

> " The range of individual differences may be indicated by those ages within the limits of which one-half of all the individuals observed attain a certain physiological development."

or, as Boas has also summarized variability:

> " When we consider children of a certain age we may say that they will not all be in the same stage of development. Some will have reached a point just corresponding to their age, while others will be a little behind, and still others in advance of their age. We may assume that the difference between the stage of their development and that belonging to their exact age is due to accidental causes, so that just as many will be less developed as further developed than the average child of a particular age."

Agreeable to the principle enunciated above, the normal range of individual variations of a given age, for any single test, may be regarded as those values within which come the attainment of one-half of those observed. In practice this may be calculated by computing the median, middle value, a 50% line for the norm, the limits of normal variation will then be those values representing the middle point between this median value and the limits of the series either way, i. e., of the 25% and the 75% lines.

As in the case of mental age, certain milestones have been determined empirically as standards by which this physical progress may be judged.

Structure and function in the human body are so intimately interrelated that they should be separated only in thought and for purposes of convenience in treatment. The more important is function, but this is often difficult or impossible to test mechanically, and moreover, is frequently correlated with or based upon structures which are visible or superficial and so subject to examination, measurement, comparison, etc. In some cases structures are significant in themselves, e. g., the teeth, but in others they are but the physical basis or outward manifestation of functions which are in consequence judged and estimated on the basis of their associated structures, e. g., pubescence. On the other hand, there are certain powers or functions which may be measured as such, without prime attention to the structures involved which may condition their functional efficience, e. g., lung capacity or strength of grip.

With the primacy of function over structure definitely in mind, it is possible as a matter of classification to group the physical tests or examinations into two divisions, viz.:

1. Structural or Anatomical, those giving evidence of, e. g., size (height), mass (weight), number (teeth), significant external signs (pubic hair).

2. Functional or Physiological, those which test power directly in such particulars as, e. g., strength (forearm grip), respiratory power (lung capacity), muscular control (tapping).

Of the two foregoing groups of physical tests only a limited number are admittedly suitable for use in connection with public school education. The basis of selection of the tests advocated herein has been to include those which come within the following requirements:

1. They must be of interest and value from the standpoint of education and hygiene. This will eliminate from the accepted list many measurements which may have a high anthropological significance, e. g., cephalic index, facial angle, breadth of hand, color of eyes, etc.

2. They must be practicable from the standpoint of conditions existing or likely to exist in public school systems. This means in the main that the accepted tests be simple so as to require a minimum of skill, in taking and of expense by way of equipment, and that they do not make too serious a demand upon the time of teachers or pupils. In the present stage of conventional modesty there must be recognized certain limitations in the extent to which the exposure of the person of the pupils will be acceptable to parents or guardians.

It should be distinctly understood that the physical tests advocated may very properly and with advantage be taken as a part of the medical examination of the pupils, but must not in any sense be regarded as a substitute for the complete examination, which involves many important considerations not intended to be included in the brief list advocated.

In the standards submitted, which are based upon the best figures available and are computed by the "generalizing" method, the age represents that of the last birthday.

It must be reemphasized, however, that both the values assigned as norms and those limiting normality must be regarded as tentative. So, in case a child shows extreme variation, i. e., beyond the limits of normality as shown by the standard, in some detail but is within the limits in all other particulars, the question may very properly be raised as to whether normal variation in the detail concerned may not be wider than the figures thus far available have indicated. It is only by repeated checking of temporary standards against many further actual measurements that values deserving of final approval may be secured.

The purpose of this study is to make selections from the widely scattered and varying data derived from relevant investigations, and from these to attempt to establish a minimum list of tentative standards for physical growth and development in the various ages of school life, approximately the ages 6 to 16. It is hoped that such standards may prove of practical value to parents, teachers, physical directors, school nurses, and examining physicians; that they may stimulate interest in the subject; and encourage cooperation in further investigations and experiments with a view to modifying and correcting these tentative standards, of rejecting those which may prove impracticable, and of adding others which may appear significant.

HEIGHT

Skeletal growth as measured by height, apart from the variations due to posture, is virtually a bone measurement and appears to be almost entirely independent of unfavorable circumstances such as malnutrition. Among the studies bearing upon this are those of Jackson(75, p. 153) who finds that young albino rats held at constant body weight for considerable periods by under feeding show a normal skeletal growth accompanied by a striking failure of the musculature to increase, which usually at the ages concerned is making rapid gains. This skeletal increase during constant body weight appears to involve ligaments as well as cartillages and bones, and tends to proceed along the lines of normal development as indicated by decrease in water content and by the formation and union of various epiphyses.

Hall(62, Vol. 1, p. 19), after reviewing the work of many investigators, states:

> "Of all single measurements, height is the most valuable. It is easily taken, is relatively constant, and is not liable to much fluctuation. Along with weight it is the truest expression of the energy of growth, the best index of health, and gives a datum from which by the use of current norms and standards, many other data can be approximately inferred. It is, moreover, the most distinctly human dimension as man alone has attained a fully erect attitude."

Rusk(123, p. 25) is authority for another statement of a similar nature, claiming that of the various bodily measurements, height most faithfully indicates general physical development, being less dependent than weight upon variable individual differences. Height measurement indicates that from 6 to 9 years is a period of uniform and rapid development and that at nine irregularities begin to appear.

> "There is at this age a retardation with girls, and with boys a more decided retardation occurs at 11 years of age. An acceleration of growth acccompanies the pubertal change, attaining its maximum with girls at 13 and with boys at 15. Girls are shorter than boys except during the years 11 to 14 when they are taller; this is due to the earlier onset of puberty of girls, giving them an accompanying advantage during these years."

Robertson(117, p. 552), basing his conclusions on studies on human subjects, concludes:

> "The variability in stature is much less than the variability in weight from which we may infer that as a criterion of abnormalty, the measure of stature is more reliable than that of weight, while as a sensitive indication of the effects of environment or dietetic fluctuations, the measure of weight is to be preferred to that of stature."

By all means the most extensive and representative figures for height of school children are the Boas-Burk tables(31, p. 262), which are derived through merging by approved mathematical methods, the figures of Bowditch, Porter, Boas and others, and include the measurements of 45,151 boys and 43,298 girls in the cities of Boston, St. Louis, Milwaukee, Worcester and Oakland.

As was noted in the introduction, it is essential, in order to allow for individual variations, to provide a standard which includes a reasonable range, on either side of the values representing the average. The usual method of calculating this is by the determination of the quartiles, the 25% and the 75% lines, and regarding these as the limits of normal variation. This has been done for boys by Hastings(70), and since his norms, the 50% line, correspond very closely with the Boas-Burk values, they may be considered as supplementing the above standard tables.

TABLE I

HEIGHT, IN CENTIMETERS, EACH AGE 6 TO 16. (HASTINGS)

	Boys				Girls	
Age	Obs.	25%	50%	75%	Obs.	50%
6	410	107.00	110.67	114.34	352	107.16
7	544	112.19	115.69	119.19	514	114.95
8	565	117.17	121.31	124.85	531	120.16
9	546	122.08	125.86	129.64	534	126.17
10	498	126.79	130.95	135.11	517	131.29
11	660	130.97	134.90	138.83	522	135.16
12	559	135.61	140.29	144.97	526	142.03
13	515	140.28	145.09	149.90	534	148.53
14	435	145.29	151.02	156.75	534	153.17
15	324	151.37	158.18	164.99	459	156.79
16	218	158.26	163.73	169.20	355	157.93

The data for the completion of the table for girls is not at present available.

This table is intended to act as a guide in determining the height development of a pupil. Should his height vary from the norm (50% value) for his age, he may still be within normal limits provided he does not fall outside the extremes (the 25% and the 75% values). Should he vary more than these, however, there is then reason to consider his other aspects of development and find the reason for his deviation from the standard.

One of the most noteworthy facts, now thoroughly established, concerning growth in height is that it is rythmic rather than regular. Data have been collected relative to daily, seasonal and development as well as annual variations.

For recording height, the regulation instrument is the stadiometer, consisting of a horizontal base to which is attached a graduated vertical standard bearing at right angles a sliding arm. The pupil, with shoes removed stands on the base, heels together, knees pressed back, chest lifted, head pushed upward, and chin slightly drawn in. To aid in attaining a vertical position the pupil may be requested to stand so that his heels, sacral and dorsal spine, and back of head are touching the vertical rod. In the absence of this equipment, the heights required may be indicated on any convenient vertical wall or, better still, projecting corner or door post. A book or right-angled piece of cardboard may be suitably graduated for the sliding arm of the stadiometer.

Some observers advocate attempting to secure the normal or habitual standing posture of the pupil, but in the writer's experience, much more uniform results are obtained by having the pupil " stand tall " or " stretch up " as suggested above. This is one test in which encouragement of the pupil to do his best may be advised.

WEIGHT

In weight, as in height, fluctuation rather than regularity is found to obtain. In general the weight development follows that in height, but is much more subject to influence by external forces, and much less determined by heredity. It is on account of this fact that weight is so frequently accepted as an index of condition by both physician and layman, and environment including work, rest, diet, recreation, etc., regulated to produce corrective results. According to Donoldson(52, pp. 49-50) the body from birth to maturity increases in height about 3.37 fold, but the weight increases 20 fold or more.

The fact that weight may be gained or lost readily renders it all the more valuable as an index of the immediate response of the organism to its environment, as well as an indication of its functioning. Trainers and coaches depend largely upon the daily " weighing in " as a guide to the condition of their men, the commonly accepted standard being that, after the preliminary loss of weight common at the beginning of the season, the weight loss of the daily " work out " should be recovered within 24 hours, otherwise the candidate is approaching " edge " or " staleness " and should have his daily expenditure of energy reduced.

As in the case of height, the accepted standard for weight is the Boas-Burk table(31, p. 263) which shows the average American weight mathematically calculated from the data of about 68,000 children.

Again considering the importance of individual variation, the data worked out by Hastings(70) offer the most convenient reference. In case of weight he gives, in addition to the deviations for boys of different ages, the data from which those for girls may be approximated; there is submitted the following table:

TABLE II

Weight, in Kilos, for Each Age of Each Sex, 6 to 16. (Hastings)

	Boys				Girls			
Age	Obs.	25%	50%	75%	Obs.	25% *	50%	75% *
6	410	18.06	19.37	20.68	352	17.62	18.50	19.38
7	544	20.30	21.30	22.30	514	19.78	20.70	21.62
8	565	21.28	23.14	25.00	531	21.22	22.17	23.14
9	546	23.11	25.07	27.03	534	23.22	24.90	26.58
10	498	25.74	27.85	29.96	517	25.61	27.16	28.71
11	660	27.49	29.86	32.23	522	27.22	29.00	30.78
12	559	30.14	32.98	35.14	526	31.26	33.06	34.86
13	515	32.15	35.60	39.15	534	35.80	37.94	40.08
14	435	35.00	39.73	44.46	534	39.47	42.92	46.37
15	324	39.93	46.95	53.97	459	42.86	46.71	50.56
16	218	47.60	52.90	58.20	355	46.09	50.38	53.91

* Estimated.

Weight is taken on platform, anthropometric scales of the Buffalo or Fairbanks types, either of which may be graduated in the metric or English units or in both. These scales are provided with two or three bars equipped with sliding, non-removable weights and with balance adjustments. Before each series of weighings, the scales should be balanced so the indicator swings freely between the two limiting bars. As a matter of convenience, the pupils should be weighed wearing ordinary indoor clothing with the exception of shoes which should be removed. On account of the fluctuations due to meals, time of day, etc., record should be made of the hour of the weighing.

Further note of time of year, recent health of pupil, and the like may also have value.

HEIGHT AND WEIGHT

No matter how favorable may be the inherited tendencies of a child, its environment has much to do with regard to the realization of its potentialities. Though environment cannot always alter the limitations set by inherited factors, it may prevent deteriorating influences from making very serious inroads on the growing individual or interfering with the best attainment of his developmental possibilities.

From the standpoint of hygiene, the most vital consideration of the child's life is nutrition. This, according to Manny(92 p. 123)

> " is not merely a matter of food, although that source of growth and energy is the central problem. Nutrition serves as an index of the result of the many strains and stresses that come from adenoids, enlarged tonsils, defective eyesight, and other effects of native disability and unhygienic living."

The standard most widely used for judging nutrition is known as the Dunfermline scale. It recognizes 4 groups, as follows:

1. " Excellent " represents the nutrition of a healthy child of good social standing.
2. " Good " is applied to those whose nutritive condition falls just short of " Excellent."
3. " Requiring supervision " describes children who are on the borderline of serious impairment.
4 " Requiring medical treatment " indicates that nutrition is seriously impaired.

In spite of the fact that these divisions do not seem to be very clearly defined, experience with the scale shows a surprisingly small variation among different examiners working on the same group of children.

Holt(73) has considered the question of some definite and measurable index of nutrition, and finds that weight in relation to age is not of greatest value, but that weight related to height is most significant. According to him the weight-height index would fix the child's status in nutrition,while annual increase in height would indicate his progress in growth, a question entirely different from that of nutrition.

The above conclusion is in accord with the suggestions of many investigators who have made similar attempts in the past.

Bowditch in 1877(22, p. 301) called attention to the importance of ascertaining the relation of height and weight in growing children, which might be expressed as a quotient.

Stephenson(128), bases results upon the figures of Bowditch for American and Anthropological Committee of the British Association, for English children. He has worked out a series of tables giving the standard weight, in pounds, for each inch in height, for boys and girls of each age from 6 to 18 years. These tables bear a resemblance to those prepared by Dr. Thomas D. Wood, published and so widely distributed by the United States Bureau of Education during the last few years.

The noted variations in the height-weight relation and in the relative development of different parts of the body, at each age, has raised the question of physical " types."

In 1910 De Giovanni(50, 51) published the results of his investigations on proportions and types. Montessori(97) in 1913 published extensive figures concerning human proportions and laid great emphasis upon the relation of length of trunk to that of limbs. Bryant(26, 27) stressed the importance of a knowledge and appreciation of the proportions of the trunk in relation to efficiency.

Goldthwaite(60) has given the most complete description of the neutral, the carnivorous or "lean " type and the herbivorous or " stout " type. His claim is that on the basis of the general proportions of the trunk may be inferred many other significant details of structure and function, such as length of intestine, shape and number of vertebrae and ribs, shape of stomach and appendix, etc. In addition to these non-visible features he shows the correlation between type, and quality of skin, pilosity, shape of feet, and other important organs. But most important of all is the demonstrated relation of type to health and disease, to occupation, and to biological principles of the development of the race.

Lewis(85) has made a study of adolescents on the basis of structural types and finds a decided preponderance of the carnivorous or " lanky " type, while the herbivorous exceeds the neutral type which constitutes only about 12% of the entire group examined. This shows a strong tendency towards the decided types and is due, Bryant claims(28), to diet, the key to the control of type and consequently to the diseases to which each type is liable.

The significance of these types from the standpoints of health, interests, capabilities and education is doubtless great, but the details of the proportions which would throw an individual of a given sex and at a given age out of the neutral and into the " stout " or the "lean " groups have not been so determined as to be generally accepted.

Taylor(132) has grouped boys into 5 rather than 3 types and has given the figures distinguishing the groups from each other.

Using height as the standard, he relates other measurements to it and only incidentally compares the measurements as a group with age.

Lowman(86, pp. 693-5) has used the material outlined by Goldthwaite and added from his own findings, giving a popular and significant outline of types and their features.

Emerson(54a), as the result of his nutrition clinics in New York, Boston and other cities is satisfied that at least 20% of the pupils in attendance at the public schools are under nourished. In order to offer an objective standard by which nutrition may be readily judged, he has published a height-weight table and has given the variations from the standard regarded as indicative of under nourishment. This table is adapted from the figures given by Holt(73) for the younger children and from the Boas-Burk tables for pupils of school age. Since the present interest is with the latter group only, his table is quoted in part.

TABLE III

EMERSON'S NUTRITION STANDARDS

	Boys			Girls		
Height Inches	Aver. Wt. for Ht. Lbs.	7% Under Wt. Lbs.	10 % Under Wt. Lbs.	Aver. Wt. for Ht. Ins.	7 % Under Wt. Lbs.	10 % Under Wt. Lbs.
40	38.1	35.4	34.3	37.4	34.8	33.7
41	39.8	37.0	35.8	39.2	36.6	35.3
42	41.7	38.8	37.5	41.2	28.3	37.1
43	43.5	40.5	39.2	43.1	40.1	38.8
44	45.4	42.2	40.9	44.8	41.7	40.3
45	47.1	43.8	42.2	46.3	43.1	41.7
46	49.5	46.0	44.6	48.5	54.1	43.7
47	51.4	47.8	46.3	50.9	47.3	45.8
48	53.0	49.3	47.7	53.3	49.6	48.0
49	55.4	51.5	49,9	55.3	51.9	50.2
50	59.6	55.4	53.6	58.3	54.2	52.5
51	62.5	58.1	56.3	61.1	56.8	55.0
52	65.8	61.1	59.2	63.8	59.3	57.4
53	68.9	64.1	62.0	66.8	62.1	60.1
54	72.0	67.0	64.8	70.3	65.4	63.3
55	75.4	70.1	67.9	74.5	69.3	67.1
56	79.2	73.7	71.3	78.4	72.9	70.6
57	82.2	77.0	74.5	82.5	75.7	74.3
58	87.0	80.9	78.3	86.6	80.5	77.9
59	91.1	84.7	82.0	91.1	84.7	82.0
60	95.2	88.5	85.7	96.7	89.9	87.0
61	99.3	92.3	89.4	102.5	95.3	92.2
62	103.8	96.5	93.4	110.5	102.7	99.4
63	108.0	100.4	97.2	118.0	109.7	106.2
64	114.7	106.7	103.2	123.0	114.4	110.7
65	121.8	113.3	109.6	130.0	120.9	117.0
66	127.8	118.9	115.0	137.0	127.4	123.3
67	132.6	123.3	119.3	143.0	133.0	128.7
68	138.9	129.2	125.0	146.9	136.6	132.2

In discussing the above table, Emerson states(54a) that:

> "All children who are habitually as much as seven per cent under weight for their height are malnourished. This degree of under weight means that the children are at least *a whole year below the normal standard which they ought to have attained.* They are not only under weight, but under their normal height also."

Emerson does not entirely disregard height in relation to age. A letter from his clinic says:

> "We make it a rule to use the weight-height ratio for the purpose of selecting that very large group of malnourished children most urgently in need of attention, and then depend upon individual diagnosis to identify borderline cases not reached by the general rule. Naturally, any child who is clearly below the height and weight measurements usual at his age, receives special consideration, even though his ratio may be normal. In such a case an actual condition of good health must be proved before it is fair to assume that he is doing as well as is possible for him to do."

This latter statement is important from the fact that arrest of height growth due to under nutrition is rapidly overcome when such stunted children are placed under proper conditions, for they soon prove that they have a capacity for growth in both height and weight not heretofore realized.

Osborne and Mendel(100, 101, 102) have given ample experimental evidence of the remarkable power of young animals to resume growth, at an accelerated rate, after long-continued retardation due to unfavorable conditions, e. g., unsuitable diet.

Retan(114) has given evidence, in graphic form, of the unreliability of using weight in relation to age as a standard of nutrition, and is satisfied that the weight-height relation affords a suitable index.

TEETH

Among the reasons for special attention to the time of eruption of permanent teeth, as an index of physical development, maye be noted the following:

1. The first permanent tooth to erupt is the first molar, which is the sixth tooth from the middle line of the face, and makes its appearance normally by the time the child is six years of age. It is, in consequence, sometimes called the six-year molar, and, on account of the fact that it erupts about the time the child enters school, it is a most convenient sign post of physical development. All too frequently, this tooth is regarded by child, teacher and parents as one of the temporary set, and since it erupts when the milk teeth are about to be shed, its

life is supposed to be of but short duration, and in consequence it seldom receives the attention and care which its position in the arch demands.

The statement of Angle(1, p. 302) is that in function and influence some teeth are of greater importance than others, the most important of all being the first permanent molars for the following reasons:

> (1) "They are the largest and firmest in their attachments.
> (2) "They have the most important location in the arches.
> (3) "Their length determines the separation of jaws, and length of bite, thus contributing to facial proportions.
> (4) "They are first in position, and influence other tooth positions.
> (5) "They are most constant in time of eruption, and in the assumption of normal positions."

2 Tooth eruption continues more or less regularly throughout school life, thus affording a practically constant indication of the rate of physical development in the individual pupil.

3. There is not required for the recording of the eruption of the teeth any elaborate equipment, nor is there great likelihood of error because of personal equation. Certain teeth either are or are not present, and if present may be seen, identified and counted. This test is therefore one of the most definite of any in use or in fact conceivable.

4. The teeth have a peculiar relation to nutrition. On the one hand the time of their eruption, their shape, condition, etc., is an indication of the pupil's nourishment up to the time of examination; and, on the other hand, the number, condition and arrangement with regard to occlusion is very definitely related to food mastication and consequently to subsequent digestion and assimilation. This latter aspect has received recent emphasis from the number of rejections of recruits on account of failure to measure up to the Government requirement in this particular.

5. There seems to be adequate evidence of the value of the age at which teeth erupt as a factor indicating development. Mackenzie(91, pp. 255-65) states that the number of teeth present at any given age is of prime importance as a test of development. Bean(12, p. 612), concludes that:

> "the teeth are more convenient and more exact as a means of determining the physiological standard than stature or weight or growth of bones or secondary sexual characteristics, etc., and they may be of greater value than any other means that can be utilized."

Beik(14, p. 203), after careful investigation, is entirely satisfied that:

"The state of advancement reached in dentition is a good indication of the stage of progress which a child has reached in its total physical development."

Bean(12, p. 601) has prepared a standard table for norms of teeth eruption of American children, but since he has not offered figures indicating normal variability, the table prepared by Woodrow(145, p. 103) which agrees closely with Bean's is selected. These figures are based mainly on the work of James and Pitts(76) who investigated 4,850 English children of school age.

TABLE IV

SHOWING THE AGES AT WHICH 50%, 25%, AND 75% OF CHILDREN NORMALLY HAVE ERUPTED THE TEETH INDICATED. (WOODROW)

Name of Tooth	Present in 50% of Children	Present in 25% of Children	Present in 75% of Children
Lower First Molar.....	6 Yrs. 0 Mos.	5 Yrs. 6 Mos.	6 Yrs. 6 Mos.
Upper First Molar.....	6 " 3 "	5 " 9 "	6 " 6 "
Lower Median Incisor..	6 " 6 "	6 " 0 "	7 " 0 "
Upper Median Incisor..	7 " 6 "	7 " 0 "	8 " 3 "
Lower Lateral Incisor..	7 " 6 "	7 " 0 "	8 " 6 "
Upper Lateral Incisor..	8 " 6 "	8 " 0 "	9 " 3 "
Upper First Premolar...	10 " 0 "	8 " 9 "	10 " 9 "
Lower First Premolar...	10 " 6 "	9 " 6 "	11 " 9 "
Lower Canines.........	10 " 6 "	9 " 9 "	12 " 3 "
Upper Second Premolars	11 " 0 "	9 " 9 "	12 " 0 "
Lower Second Premolars	11 " 6 "	10 " 3 "	12 " 6 "
Upper Canines.........	11 " 9 "	10 " 9 "	12 " 9 "
Lower Second Molars..	11 " 9 "	10 " 9 "	14 " 0 "
Upper Second Molars..	12 " 6 "	11 " 6 "	14 " 3 "
Third Molars..........	14th to 24th Year		

The range in the above table is sufficiently wide to allow not only for variation due to sex but also for those arising from other normal influences.

Despite the fact that several authorities, of whom some have been quoted, are positive as to the uniformity of the age of tooth eruption, it seems necessary to add that, as in the case of other developmental aspects, undue emphasis must not be placed upon this single index by itself. So many are the factors which may influence the time of eruption that a too rigid application of this one standard, without relation to others, might easily result in entirely erroneous conclusions. This is particularly true with regard to those areas of the dental arch subject to the greatest variation, viz., the region of the upper lateral incisors, the lower second bicuspids, and the wisdom teeth or third molars.

Motor Development

One of the most significant of all possible tests would be one showing the rate of progress in neuro-muscular coordination. Experimenters have virtually all come to the adoption of the speed of tapping as the most representative of the practicable tests of motor development. It is known that at birth the child has control of but a few muscle groups—those connected with sucking and grasping being the conspicuous exceptions. With the growth and elaboration of the nervous system comes that coordination of the neuro-muscular mechanism so well traced by Burk(30).

Hall(62, p. 142) regards " the greatest number of taps that can be made in a given brief time interval as an important determination for the development of accessory muscular control " and as a " very important measure as a factor of motor ability."

The complete laboratory outfit is rather elaborate, consisting of the tapping board, 50 x 10 cm., with brass plates 10 cm. square on either end; tapping stylus with flexible connecting wire; kymograph with its essential accompaniments; and a stop watch. This may be much simplified by the substitution of an electric counter which will record the number of taps as accurately as the kymograph.

Franz, however, is sponsor for a method of testing motor development which does not involve expenditure for equipment. He explains it somewhat as follows(56, pp. 45-46): A very simple and inexpensive method of testing this type of voluntary control is to provide the pupil with paper and pencil, and have him make a series of dots as rapidly as possible for the required interval of time. The time selected is frequently 30 seconds and may be kept by a stop watch or, for practical purposes, by a watch or clock equipped with a hand recording seconds.

The technique of taking the test is simple. Seat the pupil in a chair of suitable height with his side (right then left) towards the desk or table, so that the forearm will rest comfortably upon the support. The tapping is done by a movement from the wrist with the pencil held vertically; it begins and ends on signal and is continued for 30 seconds. Record is made of the performance of the right hand, then of the left.

Experimental data are not abundant upon which to base even tentative norms. The results obtained by Smedley(127, p. 41) and by Pyle(113, p. 25) constitute the most extensive and are given below.

TABLE V

Rate of Tapping, 30 Seconds, Boys. (Smedley and Pyle)

	Smedley			Pyle		
Ages	Obs.	Right	Left	Obs.	Right	Left
6	..	...	...	62	121	107
7	..	...	...	61	129	111
8	31	147	117	76	136	111
9	60	151	127	76	144	123
10	47	161	132	70	152	131
11	49	169	141	84	163	136
12	44	170	145	74	168	141
13	50	184	156	82	175	150
14	40	184	155	75	177	154
15	37	191	169	85	188	166
16	21	196	170	51	190	168

TABLE VI

Rate of Tapping, 30 Seconds, Girls. (Smedley and Pyle)

	Smedley			Pyle		
Ages	Obs.	Right	Left	Obs.	Right	Left
6	..	...	...	66	121	103
7	..	...	...	59	132	112
8	31	146	117	63	135	118
9	44	149	118	70	148	128
10	48	157	129	76	154	133
11	48	169	139	75	163	141
12	50	169	140	86	169	148
13	45	178	153	93	172	151
14	67	181	157	63	183	158
15	48	181	159	94	185	159
16	50	187	167	94	187	163

Note.—In Tables 13 and 14 the number of cases is not exact for Pyle's observations, since he had not always the same number for each hand; those given are for the right hand test.

In comparing the figures of Smedley and Pyle as given above it will be noticed that Smedley does not give the data for the ages 6 and 7; that Smedley's figures are higher than Pyle's except, in the main, those for girls where in some cases Pyle's results are greater; and that the number of cases on which Pyle's norms are based is greater than Smedley's.

Both investigator's, however, report less than 100 cases in each age so that it would appear that these norms are based on data insufficient to justify their final acceptance. Much further work should be done in this test not only that norms may be established but also that the range of deviation may be secured and thus the zones of normality determined.

Lung Capacity

The terms lung capacity, breathing capacity and vital capacity have been used to designate the volumetric difference between the lung content at forced inspiration and at forced expiration. It might with more propriety be termed differential lung capacity or respiratory capacity, since even after forced expiration, the lungs are by no means collapsed but contain a residuum of air roughly estimated for the adult at 1,640 cubic centimeters (100 cubic inches).

This test is of exceptional value in that it indicates both development and functional power. Not only is there given an idea of the size of the thoracic cavity but more important still of the control or mobility of the chest. Chest girth is sometimes taken as an index of lung capacity. Military requirements are frequently based on a stated expansion for a given height. This means that the difference between the chest girth fully expanded and forcibly deflated must measure a certain number of inches or centimeters for each respective inch or centimeter of total stature.

All tape and caliper chest measures, however, are partial in that they cannot record the enlargement of the thorax along the vertical axis, produced by the movement of the diaphragm, the chief muscle of respiration. These external measures are of great significance from the standpoint of diagnosis, but involve the stripping of the child to the waist, a procedure not yet common except in medical examinations.

But the volumetric displacement recorded by the wet spirometer, includes the results of all the factors contributing to the change in intra-thoracic capacity, and in consequence from the standpoint of a functional test is much superior to any measurement which may be made upon the surface.

In making this test, the pupil is asked to inhale as deeply as possible, take the mouthpiece in his mouth and exhale steadily and continuously through it into the instrument, forcing out of the lungs as much air as possible. Record the reading of the indicator at the highest point of each of the two or three trials allowed and credit the pupil with the highest figure secured. In restoring the spirometer to its initial starting position, care should be taken to remove the stopper and to press the inverted cylinder down steadily but *slowly* to its original position, replacing the stopper. Pupils should be advised to grasp the mouth piece firmly with the lips, that no air escape around it and so lower the record. Exhalation should be steady and not forced except during the latter part. Hygienic precautions in connection with assuring a sanitary condition of the mouth pieces demand that either the glass mouth pieces be thoroughly sterilized after use or, preferably, that wooden or paper mouth pieces be provided and discarded after use by one pupil; the expense is negligible. If necessary, pupils may be allowed to occlude the nostrils by pinching the nose between thumb and finger.

The norms and deviations from the standards are worked out in detail for boys by Hastings who also gives the figures from which those for the girls may be estimated approximately.

TABLE VII

Lung Capacity, in Cubic Centimeters, for Each Age (Hastings)

	Boys			Girls		
Age	25%	50%	75%	25%*	50%	75%*
6	560	830	1,000	580	710	840
7	810	990	1,170	710	830	950
8	950	1,150	1,350	830	990	1,150
9	1,140	1,230	1,520	980	1,140	1,300
10	1,250	1,480	1,520	1,130	1,270	1,510
11	1,450	1,660	1,870	1,140	1,350	1,560
12	1,610	1,830	2,050	1,300	1,540	1,780
13	1,770	2,030	2,290	1,560	1,730	1,900
14	1,950	2,300	2,650	1,620	1,850	2,080
15	2,210	2,640	3,070	1,720	2,020	2,300
16	2,640	3,140	3,640	1,880	2,140	2,380

Approximated

Forearm Strength

The finger flexors of the forearm, those used in closing the fingers as in giving a grip, are probably the most representative group of muscles in the young since they are in almost constant use in the routine of daily life. No matter at what employment or amusemnet one may be engaged there is necessarily much holding, handling, grasping, etc., which brings into functional activity this muscle group. Moreover, these muscles are of fair size, thereby giving a much more reliable index of muscular power than would a smaller group such as the flexors of a single finger which are often used in ergograph tests. According to Meyers(98) the child is born with an automatic grasping mechanism which "goes off" when stimulus is applied to the proper place, so that practice in co-ordinating the muscles involved is begun much earlier than in others producing movements of equal complexity. The actual taking of the test is comparatively simple, and with the adjustable Smedley dynamometer is reasonably accurate.

Measurement in millimeters, is first taken from the point where the pupil's thumb joins the hand, to the tips of the fingers. The manuometer is adjusted, by whirling the inner stirrup until the scale on the outer stirrup indicates one-half the distance above secured. Record this distance and set the clutch to prevent twisting of the inner stirrup during the test. Before each test set the indicator on the dial at zero. Have the pupil exert maximum grip, grasping the inner stirrup at the centre rather than toward either side. See that no part of the instrument touches any object other than the hand gripping it. Test the hands alternately, right and left, two or three times each, and select for permanent record the best performance for each hand.

TABLE VIII

STANDARDS OF FOREARM STRENGTH IN KILOS. (HASTINGS)

Boys

		Right Hand			Left Hand		
Age	Obs.	25%	50%	75%	25%	50%	75%
6	410	5.08	6.98	8.88	3.90	5.70	7.50
7	544	7.59	9.18	10.77	6.62	8.53	10.44
8	565	8.66	10.63	12.00	7.99	9.53	11.07
9	546	10.94	13.14	15.34	9.83	11.57	13.71
10	498	12.24	14.74	17.24	11.73	14.05	16.39
11	660	15.64	18.02	20.40	13.81	16.11	18.41
12	559	16.99	19.68	22.37	15.54	18.44	21.34
13	515	18.90	22.59	26.28	17.76	20.49	23.22
14	435	21.25	25.37	29.19	18.91	23.05	29.19
15	324	22.61	28.85	35.09	20.11	24.68	29.25
16	218	25.66	33.31	40.96	22.76	29.64	36.52

TABLE IX

STANDARDS OF FOREARM STRENGTH IN KILOS. (HASTINGS)

Girls

		Right Hand			Left Hand		
Age	Obs.	25% *	50%	75% *	25% *	50%	75% *
6	183	4.27	5.17	6.07	4.13	4.83	5.53
7	514	5.58	7.48	9.38	4.80	6.60	8.40
8	521	7.96	9.26	10.56	7.60	8.81	10.01
9	534	8.26	10.06	11.86	7.98	9.68	11.38
10	517	10.78	12.98	15.18	9.73	11.63	13.33
11	522	12.01	14.11	16.31	12.52	14.42	16.32
12	526	13.74	16.04	18.34	12.53	14.55	17.95
13	534	15.82	18.52	21.22	15.06	17.66	20.26
14	534	17.93	21.73	25.53	16.31	19.51	22.71
15	459	20.62	24.44	28.24	19.64	22.94	26.24
16	355	20.03	24.13	28.23	18.95	22.95	26.95

* Approximated.

PUBESCENCE

As a result of comparatively recent scientific study of individual human development, especially from the genetic point of view, there has arisen an exceptional interest in the significance of the truly remarkable transformations, both physical and mental, which are related to pubescence.

Hall(62, p. 128) briefly summarizes the relation of education to adolescence as follows:

> "It is the age of reconstruction, when new determinants come to the front and also the point of departure for new lines of development. It is the age too when, if ever, previous tendencies to abnormality may be overcome both by nature and by treatment. The law of nascent periods or the age curve of growth of each organ or faculty, is one of the first desiderata of genetic psychology; how to apply it, by what means and to what degree to stimulate each part in its stage of most and least rapid growth, and how to apportion training of mind and body between developing the powers that excel to a degree of specialized culture that corresponds to their hereditary possibilities, or educating the weakest parts and powers in order to improve proportion and symmetry, is one of the chief problems of individual pedagogy."

The original and significant work of Crampton(44) has established and to a degree popularized a method for determining from external signs the progress of this notable aspect of Physiological development, and has compared it with chronological age.

This marked transition from the asexual to the sexual life occurs at various periods with different individuals, usually between 12 and 15 years of age, but whenever it does develop the changes are profound. Crampton(45, p. 228) thus describes it: "In the short space of 6 months the child becomes a man or woman, and the process is fraught with the dangers and turmoil of a new birth. There is an outburst of physical growth, 4 or 5 inches are added to the height, 30 or 40 pounds to the weight, and the strength may be doubled in a short space of time."

The relationship of this physiological change to age of boys, as ascertained by Crampton from the examination of 3,835 boys in New York City high schools is given as follows(41, p. 232):

TABLE X

PERCENTAGE OF EACH AGE IN EACH PHYSIOLOGICAL GROUP

Age in Years	Physiological Age Groups Immature	Maturing	Mature
12.50 to 13.00	69%	25%	6%
13.00 to 13.50	55%	26%	18%
13.50 to 14.00	41%	28%	31%
14.00 to 14.50	26%	28%	46%
14.50 to 15.00	15%	24%	60%
15.00 to 15.50	9%	20%	70%
15.50 to 16.00	5%	10%	85%
16.00 to 16.50	2%	4%	93%

Dr. Wm. Burdick, Director of the Public Athletic League of Baltimore, has had observations made on girls, using as the index of pubescence, subcutaneous fat, axillary hair, appearance of breasts, and distinction between waist and hips, together with the personal statement of the girls as to the time of their development.

Part of the results of his studies may be found in the accompanying table, which is based on examinations by Dr. Mary A. Hodge, of more than 3,000 girls. The figures refer to the relationship of pubescence to age and include the ages 6 to 16 to coincide with the general ages considered in this treatment.

Crampton(41, pp. 232-4) has shown the marked relationship of the pubertal development of boys, ages 12 to 16, to height, weight, strength, etc., and has established the significance of this physiological functional development.

Educators have not realized to the full the importance of physiological age, especially in its bearing upon mental and social development. This lack of appreciation is evidenced by the fact that during the dozen years since Crampton made his masterly and widely circulated presentation of its claims, there are comparatively few educational institutions into which classification on this basis has been introduced.

Among the difficulties most frequently urged against the introduction of this basis of classification, may be noted the following: For half or more of the school life of the child, this basis of grouping has no significance, since it does not apply until signs of maturity are manifested.

The practical problem of continuous regrouping during more than 5 years, required for the entire mass of students to pass from the immature to the adolescent stage, seems to be more than the average principal or superintendent is willing to undertake. Still, it has been done. Principal Louis Marks, Public School No. 54, Manhattan, New York City, writes under date of May 3, 1920:

TABLE XI

MATURITY OF GIRLS AROUND BALTIMORE

	Prepubescent		Pubescent		Adolescent	
Age	Obs.	%	Obs.	%	Obs.	%
6	14	100.0	..	....	...	....
6.5	23	100.0	..	....	...	....
7	33	100.0	..	....	...	....
7.5	46	100.0	..	....	...	....
8	60	100.0	..	....	...	....
8.5	54	100.0	..	....	...	....
9	79	100.0	..	....	...	....
9.5	108	99.0	1	1.0	...	....
10	112	100.0	0	0.0	...	....
10.5	127	96.2	4	3.0	1	0.7
11	114	92.6	9	7.3	0	0.0
11.5	103	78.6	25	19.0	3	2.2
12	90	66.1	39	28.6	7	5.1
12.5	88	57.5	45	29.4	20	13.0
13	61	37.8	61	37.8	39	24.2
13.5	38	23.7	49	30.6	73	45.6
14	24	13.4	51	28.7	103	57.8
14.5	7	4.7	29	19.7	111	75.5
15	4	2.7	22	15.1	119	82.0
15.5	2	1.3	11	7.1	141	91.4
16	2	1.4	6	4.2	133	94.3
16.5	0	0.0	4	3.0	126	96.9
17	1	1.1	..	....	98	97.9
17.5	1	1.1	..	....	87	98.8
18	1	0.1	..	....	658	99.7
Total	1202		356		1719	
			Grand Total........................			3277

"In answer to your request of April 28th, I beg to state that we have continued the system of classification of pupils on the basis of Dr. Crampton's Physiological Age ever since it was introduced some seven years ago. We have every reason for maintaining this grouping of the boys in the upper grades of our school. The teachers find this arrangement far more helpful than the old promiscuous grouping. The emotional and social factors are the predominant reasons for continuing this plan."

In physical contests such as athletics, in playgrounds, public and Sunday School athletic leagues, etc., a division of contestants upon the physiological age basis, has been found to work out satisfactorily, subdivisions on some other basis, e. g., weight being made within each of these large groups when necessary.

An attempt has been made to correlate the three physiological groups of the ages 12 to 16 with the 25%, 50% and 75% values of the same chronological age. Since Crampton's tables of height, weight and grip show a distribution within each age, corresponding in a measure with the percentile values, some are satisfied that the percentile grouping within each chronological age is adequate. Foster(55, p. 87), speaking of classes grouped on a physiological basis, rather supports this view with regard to height.

> "There is some overlapping of height in the different grades of pubescence, but the relationship is so close between height and pubescence that it might seem to a person who had a view of the different classes at the same time as if the classification had been made according to height. All the smallest boys are found in the first grades, and all the largest in the last grades, although in the physical examination not the slightest attention was paid to the boy's weight when the degree of pubescence was noted."

From the biological point of view, however, the tendency seems to be to regard sexual development as one, and in many respects the most important, of the physical manifestations in man of the great fundamental vital principle characterizing all organisms; the common factor of which growth of all the structures and maturing of all the functions are but different aspects.

Of the various physical sign posts considered, pubescence seems to be related more definitely than any of the others, to the mental and social aspects of the pupil's development, so has additional claim to consideration, but this phase is outside the scope of the present inquiry.

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A MENTAL SURVEY OF FIRST GRADE SCHOOL PUPILS

By Margaret B. Edmondson

Introduction

That individuals differ in mental endowment throughout life has long been recognized. That this difference is shown in their ability or inability to profit from school instruction in the earliest years of school life is also commonly admitted among educators. However, it is only with the perfecting of "mental measuring rods" in the form of "Intelligence Scales" that the exact degrees of these differences or their distribution and relationship to school success or failure, can be even approximated.

We have been seeking to measure the efficiency of school systems, courses and teachers in terms of the response secured from pupils to standard questions. Students of the subject are coming more and more to realize that in order to make this a really just and accurate test, the intelligence level of the pupils should be rated first. Are the pupils of school A and school B really comparable?

Account must be taken of the work a pupil should be doing at his given mental age in measuring his retardation or acceleration, or the efficiency of the instruction he is receiving.

A mental test has been found to be the best means of segregating those for whom the regular work is unsuitable because of difference in endowment. The test picks out those for whom special instruction should be provided, in justice to themselves as well as the normal children of the grade and the teacher.

Progressive school supervisors are beginning to realize the advantage to be gained through a knowledge of the facts revealed in regard to their pupils by the intelligence tests. With the hope of demonstrating the advantage of gaining this knowledge at the outset of the school career of the pupils and of basing their classification and instruction on this knowledge, this study was made.

A careful survey of the literature revealed no such general and complete survey of beginning school pupils as is here attempted.[1] Studies bearing relationship to particular phases of the problem are noted in their proper places.

The data serving as a basis for this report consist of individual tests of the 183 first grade pupils of the public schools of Eugene, Oregon. The Stanford[2] Revision of the Binet-Simon Scale was used. The tests were all given by the writer during the period between the middle of December, 1918, and the middle of April, 1919.

All tests were given in small private rooms of the school buildings during school hours. Surroundings were made as nearly uniform in all buildings as possible. Distractions were minimized to the lowest possible limit. Thus those unavoidable differences which tend to vitiate the results from the use of this scale, through the personal equation of the examiner and different conditions at the time of giving the tests, were reduced to a minimum.

In a few cases the teacher was present because of desire to see the scale used. She, however, remained as unobtrusive as possible. Her presence did not seem to affect the result in any way.

In only one case was great reluctance displayed on the part of the subject. This was found to be due to the idea that it was to be a throat examination. As soon as the work was begun his reluctance vanished. He then admitted that he liked it. Most of the children considered it merely a novel and interesting experience and eagerly awaited their turns.

The population of Eugene is almost entirely native American middle class. There is no great wealth and little extreme poverty. All children attend the public schools. The school districts are so arranged that each draws about the same proportion of children from cultured and uncultured homes.

The group is a fair sample of the native American-born children of the north-west. There were no Oriental or colored children in the rooms studied. As is true throughout the west, a very large proportion were born outside the state, probably more than two-thirds. Every section of the United States is represented and a number are of Canadian birth. Only one foreign-born child of foreign parentage is included. She was born in Edinburgh, Scotland. In only one case is the family known to use a language other than English in the home. This is a Swedish boy. Language difficulty may have vitiated the test somewhat in this case. Noticeable differences due to language or race therefore were not encountered.

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[1] Written prior to publication of The Intelligence of School Children, by Terman: Chapter 4, Individual Differences in the First Grade.

[2] Terman, Stanford Revision Binet-Simon Scale, Warwick & York, 1917; The Measurement of Intelligence, Houghton, Mifflin Co., 1916.

The time required for giving the tests ranged from one-half hour to more than an hour, averaging about forty-five minutes. Effort was made to keep the children's attention strictly on the tasks before them, but none was hurried.

On the assumption that 6 year old children might fail on some 5 year tests, all pupils were started with the four year series. This gave a fair sample of all kinds of tests with response simple enough to gain confidence and awaken interest.

In all cases the tests were given practically in the order printed in the record sheet. The instructions were strictly followed. The full regular series of six tests for each year was used with the exception of year 10. As the vocabulary score was used for year 8 this was omitted in year 10. Also the reading test (10-4) was found unsuitable for first year pupils as it implied more formal education than they had had in order to read the passage. Consequently alternatives 1 and 2 were substituted. No tests were passed above year 10. Most normal cases failed in the 9 year group.

Data and Discussion

The distribution of the intelligence quotients of the whole 183 cases is represented in Graph 1. This surface does not present an ideal distribution. There are 107 pupils 100 I. Q. and below or 58.2%, and 76 above 100 or 41.4%. This is readily explained by reference to Graphs 2 and 3 where the beginners and repeaters are represented separately. Here the beginners present a normal distribution, there being 67 above 100 I. Q. and 66 just 100 or below that point. The repeaters group themselves about 90 I. Q. as a median, since 56% is above and 44% is below this point. This is in agreement with the findings of Terman[3] for older retarded children in the grades and shows roughly the relationship between intelligence as measured by this scale and grade progress.

Three pupils tested below 70 (50.5, 60.5, and 68), while only one tested above 130 (136). Eliminating the repeaters, however, gives again a symmetrical distribution of 7 each above 120 and below 80. So the assumption that more extreme cases of deficiency than of superiority are found is apparently without foundation, so far as the school population of Eugene is concerned. The most defective children

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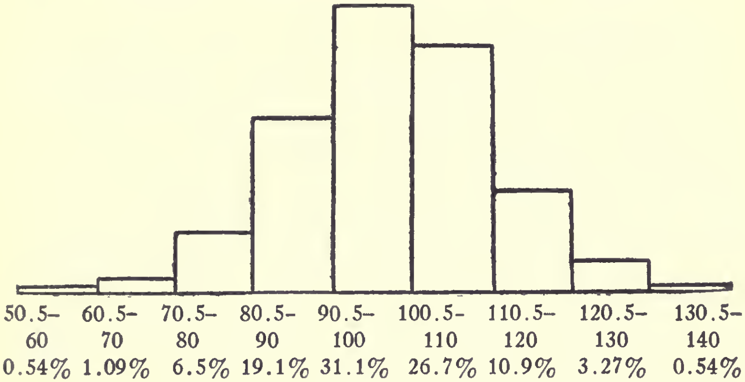
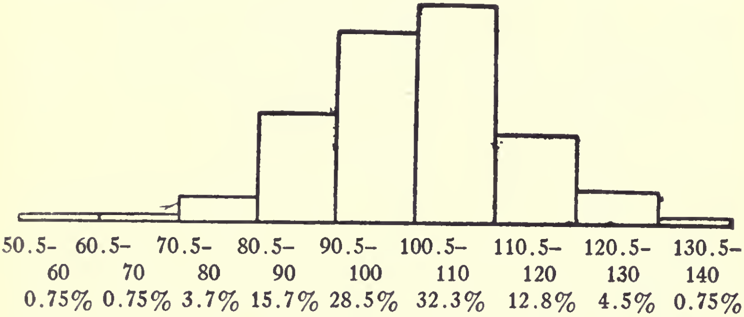
[3] Terman, Stanford Revision, p. 32.



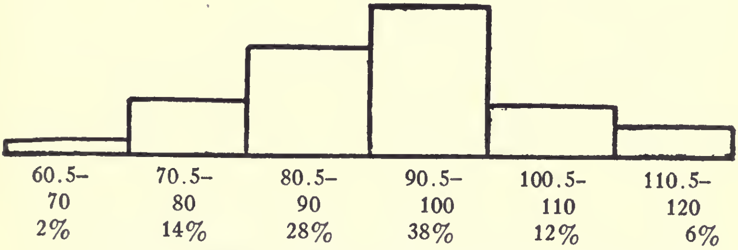
GRAPH 1. Distribution of I. Q.s of 183 First Grade Children

Above 100 I. Q. 76. Below 100 I. Q. 107.



GRAPH 2. Distribution of I. Q.s of 133 Beginning First Grade Children.

Above 100 I. Q. 67. Below 100 I. Q. 66.



GRAPH 3. Distribution of I. Q.s of 50 Repeating First Grade Children

Above 100 I. Q. 9. Below 100 I. Q. 41.

are of course not in the public schools. This again agrees with Terman's findings.[4]

Some studies of retardation begin with the third grade and state that it is a negligible factor below that grade. This study reveals the fact that 50 out of 183 pupils are repeaters in the first grade. Only 9 of this number have an I. Q. above 100. This places the beginning of the problem of the repeater with the first year of school life and shows the very great need of mental tests for school entrance that all may at least start the educational lock-step with an even chance.

The distribution of the chronological and mental ages of the 183 first grade pupils studied is shown in Table 1.

In both chronological and mental ages the groups are divided as follows: three years and one month to four years, four years and one month to five years, etc.

The chronological age is stated at the top of the table reading across the page. The mental age appears at the left reading down. The total distribution of chronological ages is given at the bottom reading horizontally and that of the mental ages at the right reading vertically.

The extremes represented by these beginning school pupils are probably as great as will be found at any age of school

TABLE 1

Distribution of Chronological and Mental Ages

Chron. Age Mental Age	5 yr. 1 mo. to 6 yr.	6 yr. 1 mo. to 7 yr.	7 yr. 1 mo. to 8 yr.	8 yr. 1 mo. to 9 yr.	9 yr. 1 mo. to 10 yr.	Total	Per Cent.
3 yr. 1 mo. to 4 yr.	..	1	..	..	..	1	0.5%
4 yr. 1 mo. to 5 yr.	..	3	..	1	..	4	2.0%
5 yr. 1 mo. to 6 yr.	1	16	3	..	..	20	10.9%
6 yr. 1 mo. to 7 yr.	3	38	23	9	..	73	39.8%
7 yr. 1 mo. to 8 yr.	1	25	30	7	1	64	35.1%
8 yr. 1 mo. to 9 yr.	..	6	11	3	..	20	10.9%
9 yr. 1 mo. to 10 yr.	..	..	..	..	1	1	0.5%
Total.......	5	89	67	20	2	183	100. %
Percent.....	2.7%	48.6%	36.6%	10.9%	1.0%	100.%	..

Average Chron. Age 7 yr. 2.1 mo. A. D. 7.27 mo.
Average Mental Age 6 yr. 11.4 mo. A. D. 7.7 mo.

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[4] Idem, p. 44.

life. This agrees with Terman's conclusion[5] that the popular belief that the range increases with age is not founded.

The range of chronological ages covers 5 years with 85.2% falling between 6 years 1 month and 8 years.

51.3% of these pupils is 7 years old or less.

11.9% is retarded already on the age basis.

In mental age the range of these pupils covers 7 years with 50.7% falling in the 6 year 1 month to 8 year groups.

11.4% is retarded according to this classification. These pupils are mentally too old for the first grade even when allowance is made for entrance at 7 years of age.

13.4% of all is mentally under the age of school entrance in the spring after an average attendance of more than six months.

This range is somewhat greater than that found by Kuhlmann[6] in Faribault, Minnesota. Here his first grade pupils covered a range of 5 years, by far the largest number falling in the 7 year group. His were also examined in the spring. As he fails to state his group limits definitely exact comparison is impossible. Kuhlmann says,

> "These conditions are surely far from ideal. Imagine what changes might result to the benefit of both the teachers and the children if all the children of any school grade were of one and the same mental age. The reasons for this lack of adaptation of teaching to the grade of intelligence of the individual children are undoubtedly many. I shall attempt to show, however, that it is largely due to the fact that the schools do not know the grade of intelligence of the individual child, nor the training capacity of each grade of intelligence as well as they might."

It is evident that a large number of the children should be more advanced in school than they are. The exact number depends upon the old question whether a child should begin school life at six years of age or not until he is seven.

Belief of parents that their children should not start to school until they are 7 years old, or nearly so, accounts in part for this situation and complicates the grading problem. Pedagogical retardation due to frequent changes of schools accounts for another part. These children are repeaters while being mentally accelerated. Illness and consequent absence from school is a third factor. The rest are the unusually bright who so far have not profited by their unusual endowment but are marking time in a grade too easy for them and learning, at the beginning of their school career, habits of laziness and less than normal effort.

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[5] Terman, Stanford Revision, p. 39.

[6] Kuhlmann, The Importance and Methods of Detemining the Mental Age of Sub-Normal Children, *Proceedings* of 62d Annual Session, Wis. Teachers' Ass'n., pp. 291 ff.

The child only 3 years old mentally is obviously feeble-minded.

The 4 year old group and most of the 5 year are borderline or doubtful cases, at best, according to Terman's[7] standards. They are all doing very poor school work. They are retarding the classes wherever they are found and are a constant strain on the vitality of the teachers. The teachers all make the same reply when asked about these pupils. "If we were not compelled to devote so much time to these few we could do so much more with the others and go so much faster and farther in our work."

Terman[8] raises the question whether school groups are more homogeneous mentally than chronologically and answers it in the negative. His conclusion seems to be entirely borne out by our data.

TABLE 2

Distribution of Chronological Ages and Intelligence Quotients

Chron. Age I Q.	5 yr. 1 mo. to 6 yr.	6 yr. 1 mo. to 7 yr.	7 yr. 1 mo. to 8 yr.	8 yr. 1 mo. to 9 yr.	9 yr. 1 mo. to 10 yr.	Total	Per Cent.
50.5–60	..	1	..	...	..	1	0.5%
60.5–70	..	..	1	1	..	2	1.09%
70.5–80	..	4	1	6	1	12	6.5 %
80.5–90	..	11	15	9	..	35	19.1 %
90.5–100	1	24	28	3	1	57	31.1 %
100.5–110	2	34	12	1	..	49	26.7 %
110.5–120	1	10	9	..	..	20	10.9 %
120.5–130	1	4	1	..	..	6	3.27%
130.5–140	..	1	..	..	..	1	0.5 %
Total.......	5	89	67	20	2	183	100%
Percent.....	2.7%	48.6%	36.6%	10.9%	1.0%	100%	

Average Chron. Age 7 yr. 2.1 mo. A. D. 7.27 mo.
Average I. Q. 97.4 A. D. 10.23

Table 2 shows the distribution of the chronological ages and intelligence quotients of the 183 pupils. As in Table 1, the chronological ages are indicated at the top reading across the page. The intelligence quotients are grouped by tens at the left, 50.5 to 60, 60.5 to 70, etc., reading down the page. The total for each chronological year appears again at the bottom of the table reading horizontally and the total for each intelligence quotient group is at the right reading vertically.

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[7] Measurement of Intelligence, p .79.

[8] Stanford Revision, p. 113.

The scattering here shows again conclusively the heterogeneity of these pupils who are supposed to do the same school work.

57.8% falls in the so-called " normal " group, namely, from 90 to 110 I. Q. But these pupils are not, as might appear at first thought from the graphs, a homogeneous group. They are scattered over five years chronological age. The mere fact that the pupils of a group show normal intelligence through their I. Q.'s and that a large number of them are chronologically at the age supposed to fit their school grade does not necessarily give a homogeneous group from the pedagogical standpoint. They are not necessarily well graded. The I. Q. alone is not a reliable means of classification. It is a means of designating individual rating only. Mental age is a far more reliable basis for classification of school pupils.

Each teacher was asked to grade her class according to the system in use in the city, namely, A, B, C, D, and E, D representing condition and E failure. Instead of grading each subject, however, she was asked to assign one letter to each pupil which would represent an average of the pupil's work and to take into consideration only the work actually accomplished by the pupils. Illness, change of schools, etc., which tend to place a pupil lower in the grade than he would be had he an even chance with the others, were not allowed to influence the teacher's markings.

The writer is fully aware of the fallacies involved in this system due to individual differences of the teachers, differences in their standards or their emphasis on different parts of the work in assigning one grade to represent all. However, this may be accepted as at least approximating the achievement of each pupil.

On this basis the pupils were divided into five groups according to the quality of work done. Each was then divided into two, one consisting of those whose intelligence quotients were 100 or below and one containing those 100.5 and above. The chronological age for each group was then averaged. These results are tabulated in Table 3.

The average chronological age of pupils above 100 I. Q. is 6 years 9.9 months with an average deviation of 4.4 months. The average of those 100 I. Q. and below is 7 years 5.2 months with an average deviation of 8 months. The average chronological age of all pupils studied (183) is 7 years 2.1 months with an average deviation of 7.27 months.

Several significant facts are shown in this table.

TABLE 3

AVERAGE CHRONOLOGICAL AGE

Pupils Grade	No.	Above 100 I. Q.	No.	Below 100. I. Q.	No. Total	All I. Q.s.
A.	29	6 yr. 11.1 mo.	20	7 yr. 10.3 mo.	49	7 yr. 3.6 mo.
B.	24	6 yr. 10.9 mo.	24	7 yr. 8.4 mo.	48	7 yr. 3.7 mo.
C.	15	6 yr. 8.5 mo.	25	7 yr. 4.6 mo.	40	7 yr. 1.5 mo.
D.	6	6 yr. 6.3 mo.	8	7 yr. 1.4 mo.	14	6 yr. 10.3 mo.
E.	2	6 yr. 3.0 mo.	30	7 yr. 0.7 mo.	32	7 yr.
Total	76	6 yr. 9.9 mo.	107	7 yr. 5.2 mo.	183	7 yr. 2.1 mo.

A.D. Above 100 I.Q.	4.4 mo.
A.D. Below 100 I.Q.	8. mo.
A.D. All I.Q.s	7.27 mo.

In the first place, the average chronological age of those pupils having an I. Q. 100 and below is 7 months greater than that of those above 100 I. Q. doing the same quality of school work. In the A and B groups, or those doing satisfactory work, the difference averages almost a year. The difference is less noticeable in those groups doing a poorer quality of school work.

The group above 100 I. Q. is more homogeneous chronologically than that below 100. This is shown by the fact that the average deviation of the former is only 4.4 months, while that of the latter is 8. months. This latter group is one which requires individual attention. The pupils are not alike and cannot be well handled in large classes. They are the repeaters, the failures, and the general misfits. Only two pupils with an I. Q. above 100 are in the E class and they are shown by their average age to be very young. It is not lack of endowment but inability to adjust themselves to school work as yet. According to their teacher, "They are just babies."

This table also shows that on the average the older pupils do better work. The chronological age decreases with the quality of work for all groups. The difference in chronological age between the A and E groups averages 8. months for those above 100 I. Q. and 9.6 months for those 100 and below. This is logically to be expected from minds in the years of growth.

A difference of 6 months in the average chronological age was noted between schools for the groups above 100 I. Q. The difference was a year and 5 months for those 100 I. Q. and below. The rooms with a high percentage of repeaters were oldest. Thus it is readily seen that comparisons of the work accomplished in these different rooms in the same school system are unjust unless consideration is given to the difference in age of the pupils and the number of them who have been in school before.

Using the teachers' estimates of the quality of the pupils' work again as a basis, they were divided into the 5 groups A, B, C, D, and E. The average mental age was then computed for each group.

49	A	pupils have an average mental age of	7 yr. 5.3 mo.
48	B	“ “ “ “ “ “ “	7 yr. 3.6 mo.
40	C	“ “ “ “ “ “ “	6 yr. 10.8 mo.
14	D	“ “ “ “ “ “ “	6 yr. 7.4 mo.
32	E	“ “ “ “ “ “ “	6 yr. 0.6 mo.
183	First grade pupils		6 yr. 11.4 mo.

A.D. 7.7 mo.

A difference in mental age of a year and 5 months is shown here between the averages for the A and E groups. The difference becomes greater with descent in the quality of work done. It is 1.7 months between A and B groups, 4.8 months between B and C, 3.4 months between C and D, and 6.8 months between D and E. This suggests again the advisability and usefulness of mental tests for classification of pupils.

In only two of the rooms studied, or less than one-fourth of the failures, is the average mental age of the failing pupils more than 6 years. They are all chronologically much older except the two pupils referred to above who have intelligence quotients above 100 and are 6 years 2 months and 6 years 4 months old respectively. This is significant in the light of the recent suggestion that a mental test be made the basis of entrance into the first grade.

As only 3 of the 32 failing pupils are repeaters and only 12 are mentally 6 years old in the spring after having been in school an average of more than 6 months, it seems a justifiable conclusion that a mental test for entrance is one way of at least partly solving the problem of the pupil who cannot do the work, retards the class, and uses up the energy of the teacher. Since 25 have been shown by Table 1 to be mentally 6 or below and only 5 of these are classed by their teachers as doing work good enough to merit a condition in the second grade next year, the requirement that a child shall be mentally 6 years old to enter school appears just and reasonable.

This table also shows the need of segregation of the inferior pupils. Even at the beginning of school life, a standard set for the so-called "average" child, while proving exceedingly easy for some, is too difficult for the less well endowed. Habits of failure and of expecting to fail are allowed to develop from the earliest school life. This is most detrimental from the psychological standpoint. It is bad alike for the poor pupils, the brighter ones who are not required to work to maintain their standing, and the teachers who are compelled to put a certain proportion of this heterogeneous group through a certain portion of the curriculum in a certain time regardless of the pupils' ability to grasp it. The teacher with a large number of pupils of poorer mentality worries because her proportion of failures for the year will be too great. The bright pupil informs the examiner that the test will be very easy for her " because everything is easy."

A comparison of these last figures with Table 3 shows that the average mental age of A pupils is higher than their chronological age. This becomes approximately equal for B pupils. The mental drops below the chronological for C pupils, the difference becoming increasingly great in the D and E groups.

A comparison was made of the average mental age of the beginners and repeaters. For the whole number (133) beginners the average mental age is 6 years 10.5 months with an average deviation of 8.06 months. For the 50 repeaters the average mental age is 7 years 2.9 months with an average deviation of 7.38 months. The difference is 4.5 months. This again indicates pedagogical retardation.

A number of pupils were found to be repeating, some even for the second time, who were not mentally retarded. The apparent reason was frequent change of schools. They are losing valuable time for want of a little special coaching to bring up special deficiencies due to difference in course of study. The system of yearly promotions is a hardship to some of these pupils also. A mental test would have shown the ultimate economy of the special teacher for a short time. They should not be forced to lose so much time as they are losing.

A study of the intelligence quotients of the pupils of different chronological ages was made. They were divided into year groups on the basis of chronological age. Those from 6 to 7 years old (including 2 not yet quite 6 and 3 just 6 years old) were placed in one group. Those from 7 years 1 month to 8 years were placed in the second group. Those from 8 years 1 month to 9 years (including 2 over 9 years old) composed the third group. The intelligence quotients were then averaged for each group.

93 pupils 6–7 yrs. old average I.Q. 101.4 A.D. 8.6
68 pupils 7 yr. 1 mo.–8 yr. old average I.Q. 96.2 A.D. 8.57
22 pupils 8 yr. 1 mo.–9 yr. old average I.Q. 84.3 A.D. 7.54

The average I. Q. for the 183 cases is 97.4 with an average deviation of 10.23.

This indicates the result of selection. The pupils mentally normal or accelerated outstrip their less well endowed fellows very early in their educational career. The laggards are apparent here in the first grade. They can be as easily segregated here for special attention and individual study as later when habits of failure and dislike of school are fixed and much valuable time has been lost. Were it not for the cases of pedagogical retardation mentioned above, the difference in these averages would be greater than it here appears. These few cases raise the average I. Q. of the older pupils so that the two kinds of retardation tend to offset each other in the averages but are easily distinguishable by the tests.

TABLE 4

AVERAGE INTELLIGENCE QUOTIENT

	No.	A.	No.	B.	No.	C.	No.	D.	No.	E.	No.	Total
Beginners	32	108.	28	104.3	30	100.2	14	96.5	29	87.6	133	99.8
Repeaters	17	91.3	20	94.5	10	88.1	..	....	3	74.8	50	90.9
Total	49	102.3	48	100.2	40	97.2	14	96.5	32	86.4	183	97.4

A. D. 10.23

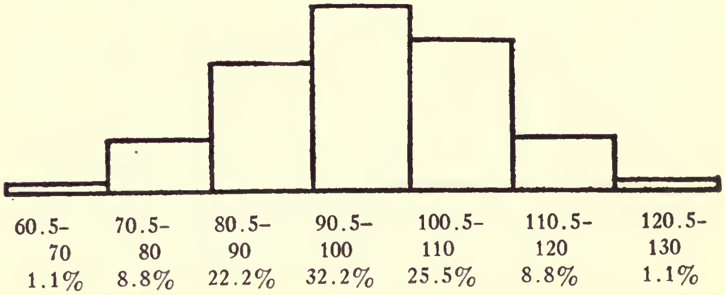
For Table 4 the pupils were divided into the same 5 groups, A, B, C, D, and E, as above, according to the teachers' estimates. The intelligence quotients were then averaged for these groups as a whole and also for the beginners and repeaters separately.

A difference of 16.7 points is shown between the average I. Q.'s of beginners and repeaters doing A work. The difference is 9.8 points for the B grade, 12.1 for the C grade, and 13.8 for the E grade. There are no repeaters doing D work. The difference averages 8.9 points for all grades.

For the beginners the average I. Q. for both A and B grades is above 100 and for C grade it is 100. For all pupils the average for A work is above 100. It falls to approximately 100 for the B grade and below 100 for C, D, and E groups, growing progressively lower. The difference in I. Q. between A and B grades is 2.1 points. Between B and C grades it is 3. points. Between C and D it is .7 point, while between D and E it is 10.4 points. The very low I. Q.'s of some of the failures (borderline cases at best) are no doubt responsible for this last very great discrepancy.

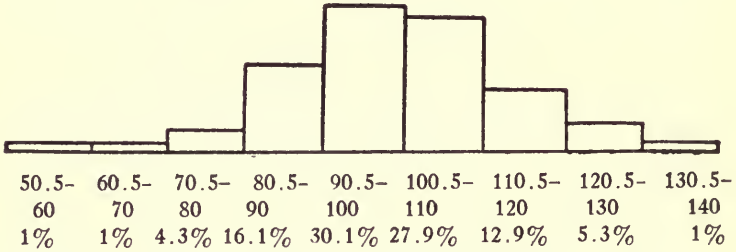
The progressive decrease in the I. Q. of the beginners from A to E groups shows that, age being approximately constant, the quality of work varies directly as the I. Q.

An attempt was made to find the sex differences among these pupils, if any exist. The results of these studies appear in graphs 4 and 5 and Table 5.



GRAPH 4. Distribution of I. Q.s of 89 First Grade Boys.

Above 100 I. Q. 32. Below 100 I. Q. 57.



GRAPH 5. Distribution of I. Q.s of 93 First Grade Girls

Above 100 I. Q. 44. Below 100 I. Q. 49.

The extremes of distribution of the boys are 68 and 121.5 I. Q. Those of the girls are 51.5 and 136.

57.7% of the boys falls in the "normal" groups (90-110 I. Q.). 57% of the girls are so classed.

9.9% of boys is "superior." 19.2% of girls has this classification.

32.1% of boys is "inferior" as against 22.4% of girls.

Of the boys 35.4% is above 100 I. Q. and 64.3% is below.

Of the girls 47.1% is above 100 I. Q. and 52.5% is below.

These percentages are somewhat lower than Cuneo and Terman[9] found for 112 kindergarten children in California. They are in agreement, however, in the fact that the median for girls is somewhat higher than that for boys. There is disagreement in that for the kindergarten children the range of distribution of the boys exceeded that of the girls while this study shows the range for the girls to be somewhat greater. The range of kindergarten boys is 61-152 while this study shows 68-121.5. That of kindergarten girls is 75-146 while this study shows 50.5-136.1 I. Q. Exact comparisons of the percents in each intelligence quotient group or even above and below 100 I. Q. are impossible because the group limits are different in the two studies.

In Table 5 the groups of pupils doing the different grades of school work were divided according to sex. Here of all pupils there is a slight superiority of average I. Q.'s for the girls in all classes except the failures. This difference is 1.6 points for A pupils, 2.8 points for B pupils, 1.9 points for C pupils and 4.4 points for D pupils. The results are reversed in the E groups because two feeble-minded girls (sisters) having I. Q.'s of 51.5 and 60.5 respectively, are included in the averages while the lowest boy reaches 68.

TABLE 5

Average Intelligence Quotient of the Sexes

		No.	A.	No.	B.	No.	C.	No.	D.	No.	E.	No.	Total
Total........	Boys	20	101.3	19	98.3	24	96.4	4	93.3	22	87.9	89	95.6
	Girls	29	102.9	29	101.1	16	98.3	10	97.7	10	83.1	94	99.
Beginners....	Boys	12	109.3	10	104.5	18	99.9	4	93.3	20	88.5	64	98.4
	Girls	20	107.3	18	104.3	12	100.8	10	97.7	9	85.6	69	101.1
Repeaters....	Boys	8	89.2	9	91.5	6	86.	..	....	2	82.	25	88.7
	Girls	9	93.3	11	96.9	4	91.1	..	....	1	60.5	25	90.8

A. D. Boys 9.38 Girls 10.66

A difference of 3.4 points in the averages for all pupils of each sex is noted, the boys having an average of 95.6 and the girls 99 I. Q. The average deviation for the boys is 9.38 while for the girls it is 10.66.

The attempt to find sex differences was carried farther by segregating the beginners and repeaters. Here the beginners among the boys are slightly superior in A and B groups, but the average again shows girls to be 2.7 points better. Among the repeaters the girls are uniformly superior to the boys except in the E group. Only one girl is repeating and failing the second time. She is one of the feeble-minded mentioned above. The difference between the sexes here is only 2.1 points. however. The same fact that was shown to be true of the sexes together appears here also when averaged separately, namely, that there is 10 points difference in the average I. Q.'s of the beginners and the repeaters doing the same quality of school work. The median for repeaters is 90 I. Q. The girls repeating average 90.8 and the boys 88.7 I. Q.

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[9] Cuneo & Terman, Stanford-Binet Tests of 112 Kindergarten Children & 77 Repeated Tests, *Ped. Sem.*, 1918, 25: 414-428.

The distribution of the intelligence quotients and the teachers' estimates of the quality of school work accomplished for all pupils studied is given in Table 6.

TABLE 6

Distribution of Intelligence Quotients and School Grades

I. Q. Grade	50.5–60	60.5–70	70.5–80	80.5–90	90.5–100	100.5–110	110.5–120	120.5–130	130.5–140	Total
E—	1	..	5	5	3	1	..	..	..	15
E+	..	2	..	4	10	1	..	..	..	17
D—	..	..	..	3	2	2	1	..	..	8
D+	..	..	..	1	2	3	..	..	..	6
C—	..	..	3	4	6	5	1	..	..	19
C+	..	..	1	1	10	5	3	1	..	21
B—	..	..	1	4	6	9	1	..	..	21
B+	..	..	..	7	6	7	5	1	1	27
A—	..	..	1	2	5	7	6	2	..	23
A+	..	..	1	4	7	9	3	2	..	26
Total	1	2	12	35	57	49	20	6	1	183

r=41

From this table a correlation of .41 was found by the Pearson formula between the teachers' estimates and the intelligence quotients. This is not high. There are several reasons for this fact. One prominent factor is the proportion of repeaters who have low intelligence quotients but because of greater age and previous experience are able to do good work. But the greatest fault is that for a good correlation the Pearson formula requires a similar distribution in the two sets of figures correlated. Reference to the total numbers of the various grades as assigned readily reveals the fact that the teachers' estimates do not provide a normal surface of distribution while the intelligence quotients are so distributed. The system of grading used in the schools does not fit the "normal probability curve."

Conclusions

The foregoing data suggest the following conclusions:

1. Tests of 183 first grade pupils show that their intelligence levels are distributed according to the normal curve. The repeaters over-weight the lower side. The beginners are evenly distributed on each side of 100 I. Q. as a median. The median of the repeaters is 90 I. Q.

2. The range of chronological and mental distribution is apparently as great here as at any stage of school life.

3. The mental age of these pupils is less homogeneous than the chronological, the chronological being distributed over five years of age and the mental over seven.

4. Pupils having I. Q.'s falling in the normal groups do not necessarily represent a homogeneous class from the pedagogical standpoint. The I. Q. is a means of individual rating. Mental age is more reliable for a group.

5. Pupils with an I. Q. above 100 are a more homogeneous group than those who fall below. These latter cannot be well handled in large classes. They must have individual study and instruction.

6. Pupils chronologically older do better work on the average, the chronological ages of both the mentally accelerated and the mentally at age or retarded decreasing steadily with the quality of school work.

7. If pupils have a lower I. Q. they must be chronologically older to do the same quality of school work; for example, in the whole group averaging 100 I. Q. and below and that 100.5 I. Q. and above, doing the same quality of school work, the difference in average chronological age is 7 months. For those groups doing satisfactory school work it is almost a year.

8. The quality of school work decreases with the mental age of the pupils.

9. Comparison of work accomplished by different rooms is unjust unless the chronological age, intelligence level, and proportion of repeaters are all taken into account first.

10. Age being relatively constant the quality of school work varies directly as the I. Q.

11. The average I. Q. of pupils between 6 and 7 years old is above 100. That of older pupils is below 100. This is the result of selection, many of these latter being laggards.

12. Beginning pupils doing A and B work are mentally slightly accelerated. C pupils are just at age. D and E pupils are slightly retarded.

13. A difference of 3.4 points was found in the average I. Q.'s of the two sexes, girls being slightly superior.

14. The correlation between the teachers' estimates of the quality of work done by the pupils and their I. Q.'s is .41. The fact that the two sets of figures are not similarly distributed is one factor tending to lower this figure. The inclusion of repeaters is another.

15. The number of feeble-minded and borderline cases show the need of a special class.

16. The number of pupils who would profit by an "opportunity" class is considerable.

17. Retardation begins in the first grade as a noticeable factor, 27.3% of these first grade pupils being retarded.

18. The fact that the average mental age of the repeaters is higher than that of the beginners shows pedagogical retardation. Better adjustment in this first year of school life is needed.

19. Pupils must be mentally 6 years old to do satisfactory first grade work.

20. Mental tests for entrance and classification of pupils would at least partly improve the situation existing among these first grade pupils.

The writer wishes to express her appreciation of the suggestions and assistance given in the pursuance of this study by Dr. B. W. DeBusk of the department of education of the University of Oregon, under whose direction it was carried out; by the faculty of the department of psychology; and by the teachers of the first grades in the public schools of Eugene.

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THE DEVELOPMENT OF CHILDREN BETWEEN THE AGES OF TWO AND SIX YEARS*

By Carl Schiotz

The following investigations were carried out with the assistance of the office in charge of adopted children (under the Kristiania Board of Health) through Miss L. Uchermann (Chief), Miss Signe Aasgaard, Mrs. Ruth Strom. The collection of data took place in May, 1919, through visits at nursing homes and asylums for children. A total number of 513 children, 264 boys and 249 girls were examined. Their distribution by age is seen from Table I. As "two-year-olds" were counted all that had completed their second, but not their third, year, hence the average age of such children is about 2½ years, etc. No selection was made except such as occurs naturally by the incidental absence of certain children on the day of visit, and by the objection of a small number of parents to the investigation of their children.

The material is being used here for two purposes: I, as a contribution to the study of the laws of development of children of the aforesaid groups; II, for the purpose of practical hygiene.

I. Contribution to the Study of the Laws of Development in Children between 2 and 6 Years

Foreign literature is rich in data on the development of school children and of infants, at least in regard to average relations, but a corresponding study of the ages here considered is relatively scanty.[1] From Sweden—considering Scandinavia—only one series of investigations, by Tornell, in 1917, is on record, considering 285 children, of which 122 were under two years, the rest—163—from 2 up to and including 6; of these 82 were boys, 81 were girls.

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* This study by Dr. Schiötz originally appeared in the Norsk Magasin for Laegevidenskaben, May, 1920. Dr. Christian Bay's translation secured by the Bureau of Educational Experiments was made available for publication in the *Pedagogical Seminary* through the co-operation of the American-Scandinavian Foundation and the courtesy of Dr. A. G. Gade, Editor of the Norsk Magasin for Laegevidenskaben.

[1] Weissenberg (South Russian Jews); Variot-Chaumet (Paris); Camecasse (Paris, 4-14 years); Erismann (Russia); Heubner (Berlin); Camerer (Stuttgart); Puig i Roig (Barcelona); Bowditch (Massachusetts); Morgan-Rotch (Boston); Soley (Barcelona).

The Anthropological Committee of Denmark, on the instigation of Poul Hertz, has undertaken measurements and weighing of institutional children in Copenhagen, in 1910-1911. Through the kindness of Dr. Hertz and Police Physician Soren Hansen I have been able to utilize the data concerning average height, weight and "ponderal index," from these studies. This material covers ages 1-12. Between the ages 2-6, 919 children (in 1910) and 1259 (in 1911) were examined. The final results of these investigations have not yet been published.

1. *Body Height*

Table 1 gives the statistical data from our material. This being limited, the conjectural sources of error may not be inconsiderable; it amounts to 4-5 millimeters for the averages, and 7 millimeters for one single class: 2 year girls. The averages in themselves are fairly good, but the increments from year to year are difficult to handle.

TABLE 1

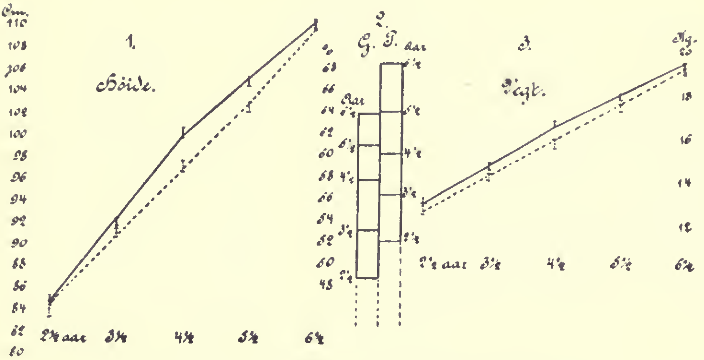
Boys

						ROUNDED-OUT VALUES				
Average Age	Number of Observations	Average Height cm.	Probable Errors	Difference with Standard cm.	Co-efficient of Variation	Probable Errors	Aver. Height	Increase cm.	Increase %	Increase in Height, in % of Total Development
2½	40	84.82	±.46	4.35	5.13	±.39	84.5	...	...	...
3½	51	91.88	.46	4.84	5.27	.37	92.0	7.5	8.9	6.2
4½	51	100.27	.48	5.12	5.10	.34	100.0	8	8.7	6.7
5½	58	105	.45	5.12	4.89	.31	105.5	5.5	5.5	4.6
6½	64	110.37	.42	5.02	4.55	.27	110.5	5	4.7	4.2

Girls

						ROUNDED-OUT VALUES				
Average Age	Number of Observations	Average Height cm.	Probable Errors	Difference with Standard cm.	Co-efficient of Variation	Probable Errors	Aver. Height	Increase cm.	Increase %	Increase in Height, in % of Total Development
2½	29	84.03	±.74	5.94	7.07	±.62	84.0	...	...	...
3½	50	91.20	.49	5.10	5.59	.38	91.0	7	8.3	6.4
4½	52	97.15	.50	5.31	5.47	.36	97.0	6	6.6	5.5
5½	61	102.63	.43	5.03	4.91	.30	103.0	6	6.2	5.5
9½	57	110.21	.41	4.63	4.20	.27	110.0	7	6.8	6.4

FIG. 1



Hoide = Height G = Gutte, Boys
Vegt = Weight P = Piker, Girls
———— = Boys
- - - - - = Girls

Fig. 1, curve no. 1, shows graphically a comparison of the average height of boys and girls—an approximately reasonable curve. The vertical lines indicate the average figures and their probable errors (cf., for this method of demonstration the Med. Revue, 1919, pp. 157-158). Foreign data uniformly show—this includes the aforesaid Swedish investigations—*greater bodily height in boys than in girls, in these groups of ages.* Our material yields a corresponding result. Owing to the general agreement on this point we may consider this sex-relation as a certainty, even though our material does not fulfill all demands of mathematical, statistical, correctness.

The " rounded-out " values of Table I designate the course of the curves read from millimeter paper and reduced to the nearest half-millimeter.

It will be of interest to compare these with the foreign results.

Table 2 shows a comparison with the aforesaid Danish investigations and with those of Tornell in Sweden. The latter were collected in the course of public vaccinations. Even though the source of error is greater in the Swedish figures, on account of the proportionately fewer number of individuals (9 to 31 in each year's class), the results still are worthy of attention considering that they show a large differ-

TABLE 2

HEIGHT IN CMS.

	Boys				*Girls*			
Age	Kristiania 1919	Copenhagen 1910–11	Norrtälje 1917	Paris	Kristiania 1919	Copenhagen 1910–11	Norrtälje 1917	Paris
2½	84.5	82.5	89.0	82.7	84.0	86.7	86.0	81.8
3½	92.0	91.2	96.0	89.1	91.0	92.5	94.0	88.4
4½	100.0	97.9	106.0	96.8	97.0	99.0	106.0	95.8
5½	105.5	102.3	110.0	103.3	103.0	104.5	109.0	106.9
6½	110.5	108.6	118.0	109.0	110.0	108.8	115.0	108.9

WEIGHT IN KILOS.

	Boys			*Girls*		
Age	Kristiania	Copenhagen	Norrtälje	Kristiania	Copenhagen	Norrtälje
2½	13.0	13.0	13.5	12.5	13.0	12.3
3½	15.0	14.7	14.7	14.5	14.7	13.1
4½	16.5	16.3	17.2	16.0	16.5	16.6
5½	18.0	17.4	18.9	17.5	18.1	17.4
6½	19.5	19.7	20.2	19.0	19.3	19.8

ence through all the various ages. This is in part explained by the uniformity of the social stratum from which the Kristiania data were drawn. The table also shows data closely related to those of Variot-Chaumet's Paris children.

A comparison between the Norwegian and the Danish results shows decided agreement as regards weights,—generally also for heights. A peculiar feature of the Danish studies is that girls of all ages are taller than boys, while the weights are equal for both sexes in 2-, 3-, and 4-year-olds and greater for boys at 6½; greater in girls at 5½.

In most studies we find that uniformly the body height is greater in boys than in girls, of the given groups. The weight relations show corresponding results. Are the boys of these classes thus more developed, or better developed? Conclusions of this kind have no logical foundation. The degree of development is not evident from these, or from similar, averages. In order to answer the question logically it is necessary to find out, for each age, how much each sex has attained of its specific development, e.g., how many per cent of the final specific development have been covered. Our material cannot give a true answer to this problem, because we do not know the exact average height for grown individuals of the same category as is represented by our material. The error in this comparison between the sexes would, however, be very small, if we accept the ascertained averages for Norway: about 172 cm. for men and 160 cm. for women.

The graphic delineation Fig. 2 demonstrates how far the various classes have progressed in per cent of the final height. At 2½ years the boys (84.5 cm.) have attained about 49.1% of the final height (172 cm.). The girls have attained 84 cm., or 52.5%, of their final height (160 cm.). Thus, the girls of the given classes have attained considerably more of their height than do the boys. A girl of 5½ years would have attained as much height as a boy of 6½ years.

Weissenberg has published a detailed table of body height and various other body dimensions, figured according to this method.

The body height of a single child in itself permits of no conclusions concerning the total development of that individual. By total development we understand especially psychic development and development into an individual capable of propagation. In the calculation of averages, however, there is a distinct parallelism between average height on one side, and psychic development and puberty on the other. If a group of children at a given age shows great body height, it also shows a greater psychic development and eventually also a more advanced state of puberty than is found with individuals of equal age, but with a small development of body height. In a mass of material for children, the average body height may be considered an indicator of the total development, and therefore is of great importance. This fact was brought out in two previous studies (17) and by an investigation at Stavanger in 1918 (19).

NOTE.—For an (objective) judgment of the physical stage of development of individual children, certain relations between the body height and the ossification of the skeleton (e.g., roentgenographs of the hand) undoubtedly are the best criteria. For older children, data are to be adduced from the signs of puberty and the secondary sexual characteristics.

From this we proceed to the study of the growth from one year to another. Here we again must point out that the calculation of averages in centimeters and kilos certainly is of practical importance in the comparison of individuals and in the checking up of selected ones,—but for a study of the laws of growth these absolute figures are quite useless. A study of growth presupposes certain co-efficients. Two methods may be considered:

How much increase does a child (or the year-class of children) show in proportion to the final development (e.g., at the age of 7-8 years perhaps 3.2% of the height attained at the age of 7)? Only this figure will give a true expression of the growth-energy and makes real comparisons possible, so that the laws of growth can be inquired into, for the two sexes, for various ages, for different races—and even for a comparison of various classes of animals. These co-efficients are of a far greater biological interest than the (arbitrary and) absolute units of measurement. Even direct comparisons of the increases in weight and height become possible. Thus, girls at 13½-14½ years—height increase 4%, weight increase 14.3% (of the figures at 13½ years). It is evident that these figures allow a far deeper insight into the biological relations than the absolute figures[2]—6 cm. and 5.5 kilos—ever would. Again, boys, 14½-15½ years, weight increase 18%; girls of same age 9%. The absolute figures yield no useful comparison of the biological relation or of the energy of development, because they do not permit a consideration of the initial figures—the weight of 14-year-olds—upon which the relation really rests.

Regarding once more our own material, we already have made it clear that the probable errors in the averages render a mathematically correct calculation of increases impossible. A closely approximated calculation is found in Table 1. We do not consider closely the absolute values, or the increases in cms., because they allow of no intelligent conclusions in regard to the energy of growth. (On the contrary, these values might lead to the belief that the growth for boys about 4 years—i.e., from 3½ to 4½ years—is greater than it is at about 3 years.) While small errors occur in the decimals, we still observe that the per cent of increase, the growth-energy, in boys at these ages (3-6 years) is very greatly decreasing, namely, from about 9% about their third birthday to about 4½ at their sixth birthday: a decrease of nearly one-half. Boys are the strongly-growing sex at the ages between 2½ and 4½; during the following two years this relation is reversed.

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[2] None of these have been used in the better known works on growth relations (Key and Weissenberg; a new and very large work by Demoor, etc.). Friedenthal considers only the growth in percentage. W. Kiorgaard applied successfully his data concerning percentage of growth increases in children's sanitoria in Copenhagen and its surroundings.

We mentioned that the co-efficient of increase—a good term introduced by Spitzy (who brings no tables, however, developed on this principle)—makes it possible to compare widely different ages. Figures as high as 8% per annum—2½-4½ year boys—are not attained at any subsequent age in life. The values for 4½-6½ year boys (5½ and 4½%) designate the beginning of the transition to the relatively lower figures characteristic for the years of attendance at school (about 3.3%)[3]—and are attained only once in later life, namely, during the years of greatest growth-increase during the period of pre-puberty, about the fifteenth birthday (5½%). Thus, the growth-energy of the age 2½ to 4½ years is twice that of the years of school attendance. The growth of the period 4½-5½ years corresponds to that of 14½-15½, or ten years later. The values for girls at the ages 2½-6½ (always above 6%) never is attained later in life, as the period of pre-puberty never shows figures as high as 5%.

The variation in height among the individuals—expressed as a co-efficient of variation—also is seen at Table I. The figures vary generally between slightly above 4 and slightly above 5 and are greater in the younger classes—and descending when the years of school attendance are reached, at which previous investigations, both of girls and of boys, have shown a figure of a little above 4, with an increase toward the period of pre-puberty (above 5), followed by a rapid decrease. During the years of strong development a great difference is found amongst the individuals of each year-class. Naturally, a difference in age of one year (between the youngest and the eldest child of a year-class, must result in a greater difference in height between the younger and the elder children, when normally the growth during the same year is intense. This, however, does not in itself explain the phenomenon; if so, the variations found during the years of very intense growth—2½-4½ years—would be much greater than during pre-puberty, when the growth is less strong. But this certainly is not the case with the boys.

Another factor might serve to explain the great variations during the years of intense growth. The supposition is not unreasonable, that the mutual differences in living conditions and influences will be felt very decidedly during the years of intense development. Inherited peculiarities also might exert some influence.

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[3] Previously published investigations. Certain minor errors, due to the unevenness of the material, will not disturb the total value of a given series in any appreciable way.

The second method in calculating increases in growth—not useful, however, in illustrating the *energy* of growth from year to year, because there we always must consider the initial height, the height of the youngest child—must develop as a reply to the following question: How great a portion of the total growth from newborn to fullgrown is accomplished during a certain year? If we look once more at Table 1 (at the right), we find this to be, for boys during the whole period of 2½-6½, 21.7%; for girls, 23.8%. (The figures for newborn children were derived from data collected by Marie Kjolseth; as normals for fullgrown we take 172 cm. and 160 cm.)

All in all, our study of the laws of growth (co-efficient of growth, etc.) makes evident that *there is a pronounced biological difference between girls and boys also during their early years of life.* Such terms as "a sexual period" in contradistinction to the "bisexual," which was supposed to begin some time previous to puberty, must be abandoned as wholly unscientific and moreover as unpractical. Spitzy et al. talk about a "neutral period" as between 2 and 7; a "bisexual" period between 8 and 15. Why from the eighth year?

TABLE 3

							Rounded-out Values		
Age	No. of Individuals	Aver. Wt. Kilos.	Probable Errors	Variation From Standards Kilos.	Co-efficient of Variation	Probable Errors	Weight Kilos.	Increase Kilos.	Increase %
				Boys					
2½	40	13.09	±.16	1.52	11.61	±.89	13.0	...	..
3½	51	14.75	.17	1.76	11.93	.81	15.0	2.0	15.4
4½	51	16.70	.15	1.62	9.70	.65	16.5	1.5	10.0
5½	58	17.96	.17	1.91	10.64	.75	18.0	1.5	9.1
6½	64	19.32	.17	1.96	10.15	.66	19.5	1.5	8.3
				Girls					
2½	29	12.74	±.26	2.11	16.60	±.55	12.5	...	....
3½	50	14.23	.17	1.86	13.07	.90	14.5	2.0	16.0
4½	52	15.79	.19	2.04	12.93	.87	16.0	1.5	10.3
5½	61	17.44	.17	2.02	11.56	.73	17.5	1.5	9.4
6½	57	19.14	.17	1.94	10.02	.65	19.0	1.5	8.6

2. *Body Weight.* Compare Table 3 and Fig. 1 (curve 3)[4]

An increase from 13 to 19.5 kilos in boys, from 12.5 to 19 kilos in girls. The increase—percentage—uniformly is greater in girls than in boys, and for both sexes decreasing down to about one-half. The averages for body weight, as aforesaid, are greater in boys. The percentages of growth-increase are considerably greater than those of height increase, e.g., boys (2½-4½ years), height-increase 8.9%, weight-increase 15.4%. But while height-increases of more than 8% was not attained later in life, boys of the period of prepuberty attain greater values for weight-increase than during their early age (in my Kristiania material, 17.9% in boys of 14½-15½ years, but not in girls).

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[4] Comparison with Tornell's Swedish results, *vide* Table 2.

A comparison with Tornell's Swedish figures shows in general—yet there are some exceptions—lower figures for Kristiania children than for Swedish children.

The variation in body weight—calculated as variation-coefficient—averages twice that in height. A study of the ages 12-17 in Kristiania showed the weight-variation to be even three times that of height-variation. The weight-variations brought out in our material do not reach what we found in boys at the ages 13-16.

Finally, not the least important problem to be considered is the weight-height relation calculated as a "space-index"—the weight, in percentage, of a cube whose edge equals the body height, the relation as follows: $\frac{\text{Weight X100.}}{\text{Height}^3}$ Compare *Med. Revue,* 1919, April.

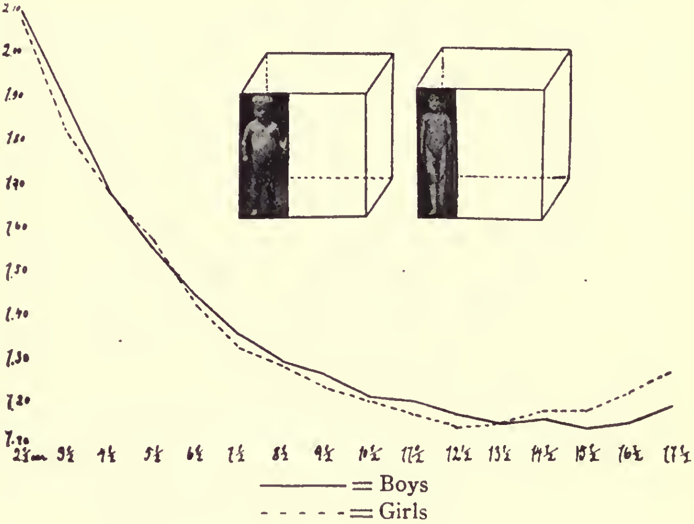
3. *The Weight-Height Relations of the Body*

The space index has been determined for each child; the averages for each year-class are seen in Table 4 and have been expressed graphically in the curve in Fig. 2, which also contains averages of the material dating from May and November, 1919.

TABLE 4

Age	"Space Index"	Probable Errors	Variation From Standard	Co-efficient of Variation	Probable Errors	Index Rounded-out Values
			Boys			
2½	2.13	±.022	.20	9.63	±.73	2.13
3½	1.91	.018	.19	9.55	.64	1.90
4½	1.66	.018	.18	10.92	.73	1.67
5½	1.55	.014	.16	10.19	.65	1.54
6½	1.45	.012	.14	9.76	.58	1.44
			Girls			
2½	2.13	±.031	.25	11.96	±.94	2.13
3½	1.87	.018	.19	10.13	.78	1.89
4½	1.73	.017	.18	10.61	.71	1.73
5½	1.61	.016	.18	11.18	.70	1.60
6½	1.41	.013	.14	10.01	.64	1.41

FIG. 2



The curve, developed from calculations of averages of the May and November-results shows for ages 2-6 uniformly a greater weight-height value for boys than for girls, excepting the class 5 where the girls show a slightly higher figure. In class 4 there was no difference. The remainder of the curve, to be discussed later, also shows a higher figure for the boys, up to and including class 12. Therefore, it is a question whether year 5 should be considered a valid exception. That the girls show a considerably lower weight-height relation than the boys, in all these years, may rather with certainty be referred to their relatively more rapid development. About the twelfth year is the period of the strong puberty growth in height of girls, after which period the growth takes a more quiet course, and then the weight-height values increase until at the point of class 12 it exceeds those of the boys.

The calculated average for the space-index demonstrates very plainly the very intense decrease of weight in proportion to height which is found during the infancy period of 2½ to 6½ years—from an index for 2 year boys of 2.13 to the value of 1.44 (=68% of the figure at 2 years) at 6 years—for girls, from 2.13 at 2 years to 1.41 (66%) at 6 years.

The variation in body-space is very great—the coefficient on the average about 10. It should be observed, however, that girls—pupils at the communal schools in Kristiania—of the age 13-16 show an equally great variation individually, but this is not true of boys of the same age.

We shall add here some remarks on the methods used in calculating the weight-height relation, Rohrer's "Index der Korperfulle." A glance at the photographs of the average types of 2 year olds and of 6 year olds (Figs. 3a and b), the slenderness of the latter, as compared with the former, is very evident—a fact otherwise so well authenticated that no further demonstration is necessary. This relation, of course, is still more evident by comparing the 2 year old with the 11 year old.

Although the body-total, considered through observation of outward relations, will not find an adequate descriptive expression in the weight-height relation, it still remains true that there is a high degree of parallelism between these features, and consequently we may expect that a method aimed as a calculation of weight-height relations will show strongly decreasing averages from 2 year olds to 6 year olds and further to 11 year olds. If this were not so, the usefulness of the method might well be subject of strong doubt. Rohrer's weight-height index shows for boys of 2½ to 6½ years, a decrease from 2.13 to 1.44; for girls, from 2.13 to 1.41.

Another method is Livi's "ponderal index." The aforesaid Danish tables, kindly placed at my disposal, gives averages for height and weight—the results of these, the first measurements taken in Scandinavia from children of tender age—and these data are especially valuable because they still form the largest bulk of Scandinavian material on these lines of research. They also contain a calculation of Livi's ponderal index.[6] This shows for boys of 2 years in 1910 .0274 (same in 1911), for 6 years .0249 (same in 1911); for 2 year girls .0271 (.0272 in 1911), and for 6 year girls .0247 (.0246 in 1911). Thus, this method demonstrates but very imperfectly the undoubtedly very considerable decrease in weight in proportion to height.

A certain bulk of material investigated by rational methods and considered as a status praesens at a given period of time, always possesses the interest of adding to the knowledge of the investigator—perhaps also of others. Thus far we have considered our results as a contribution to our knowledge of the growth relations for the ages of childhood under consideration. The material being rather uniform, perhaps even one sided, it still adds to our knowledge of the development of children of the given milieu. It must be remembered that the averages *from a highly differentiated material* MAY render the true interpretation of the laws of development obscure. A certain portion of material may exemplify a rather strong development, while another portion may represent a weaker development. The averages may yield a rather neutral result, which in reality fails to characterize any one distinctive component group of the total material.

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[6] $\frac{\sqrt[3]{\text{weight}}}{\text{height}}$

Our results, however, are so closely in harmony with those of other countries that our conclusions—especially those concerning a comparison between the two sexes—certainly are capable of a wide generalization. This, of course, renders the material more valuable for the general purpose of a study of the laws of growth in general.

We here take leave of the " theoretical " studies of growth. The problem before us—concerning, as it does, not only the physician but also the practical hygienist—is whether these investigations may assist in *bettering any actual conditions.* First we shall view our material in its usefulness as a possible means of comparing or judging the physical status of children of these ages. Such material is greatly needed, inasmuch as no other Norwegian material is at hand, and other Scandinavian work in the same line is scanty. Secondly, we shall report on the material from its aspects as the means of affording a hygienic control of the children represented in our data.

II. THE PRACTICAL UTILIZATION OF OUR MATERIAL

Even with the most severe restrictions we are obliged for the present to admit that our data will serve as a normal exposé of investigations at spring time,[7] of conditions as they exist among a population which makes systematic use of a day nursery or a children's asylum.

A. How far the results are applicable beyond this social group, we shall try to investigate in the following pages. So far as the average, or medium, heights are concerned, we may suppose them somewhat too low to be considered normal for Norway or even for Kristiania, on account of the material having been extracted from a one-sided stratum and representing only a socially less opulent class.

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[7] The material was collected in the month of May

A similar consideration may be applied to the values for absolute weight. These absolute weights, however, are—apart from those of the first two years of life and especially of infancy—of less interest for the problems now considered in view of the body-height and the relation of weight-height. Strongly characteristic of the material at hand is the relation of body height to weight, weight-height index. This leads us to the question whether the results for the weight-height relation may be used outside of the given social class. For the purpose of deciding this we present a group of average types for each year-class (Figs. 3a and 3b). (The communication of the investigator's " impression " or even of his " most decided impression " of the quality of his material, counts for nothing; it no longer interests me, nor do I ask any such interest of others.)[8]

No attempt has been made to select faultless children in these groups. Rachitic individuals are partly distinguishable. The selection was made from the slips bearing previously recorded data, and from these slips the children were selected for inclusion in the groups to be photographed. The recorded height of the photographed children average .5 cm., their weight .6 kilo and—which is of greater importance—their weight-height index but .005 from the average values for the individual sex and ages. The height, weight and height-weight index is given for each child and from each sex the same data for each group, for comparison with the averages. Curves also have been constructed, from which we see that the photographed children generally are slightly " lighter " than the medium value for the year-classes, excepting the 4 year boys, the one 2 year girl who is slightly heavier, and 5 year girls who are stationed exactly on the average.

In spite of the generally too low weight-height values the photographs will be found indicating a rather better nutritive condition in the children than one might expect. Even though nutrition and hygienic provisions at the nurseries might be supposed quite satisfactory (although they naturally are not equally good at all of them), it must be remembered that many children have been under their care only for a very short time—two of the nurseries are but provisional stations for children—and therefore can show no definite improvement. In considering the day nurseries account must be taken of the relatively long sojourn of the children at their homes (at night, on holidays and during long vacations),

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[8] On June 1st.

FIG. 3a

		Height Cm.	Weight Kilos.	H.-W. Index
		2 YEAR OLDS		
B.	Aver.	84.5	13.0	2.13
	Photo	84.5	12.4	2.05
G.	Aver.	84.0	12.5	2.13
	Photo	83.3	13.0	2.20
		3 YEAR OLDS		
B.	Aver.	92.0	15.0	1.90
	Photo	92.5	14.5	1.84
G.	Aver.	91.0	14.5	1.89
	Photo	91.3	14.2	1.87
		4 YEAR OLDS		
B.	Aver.	100.0	16.5	1.67
	Photo	100.3	17.4	1.72
G.	Aver.	97.0	15.0	1.73
	Photo	97.1	15.3	1.67

2 aar

3 aar

4 aar

Height Cm.	Weight Kilos.	H.-W. Index
2 YEAR OLDS		
83.3	13.0	2.20
84.8	12.9	2.12
84.1	12.2	2.05
84.6	12.2	2.01
3 YEAR OLDS		
92.3	14.2	1.81
92.7	14.8	1.86
91.2	13.9	1.83
91.4	14.5	1.90
4 YEAR OLDS		
101.0	17.2	1.67
99.4	17.2	1.75
100.5	17.7	1.74
100.4	17.5	1.73
97.4	15.1	1.63
96.2	15.3	....
97.6	15.4	1.72
....	....	1.66

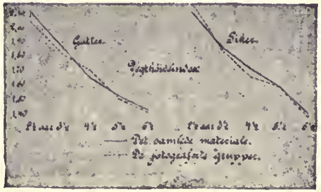
B = Boys; G = Girls.
Aver. = Average values of the whole material.
Photo = " " of the group in the photograph.

FIG. 3b

		Height Cm.	Weight Kilos	H.-W. Index
		5 Year Olds		
B.	Aver.	105.5	18.0	1.54
	Photo	105.7	17.8	1.51
G.	Aver.	103.0	17.5	1.60
	Photo	102.5	17.1	1.60
		6 Year Olds		
B.	Aver.	110.5	19.5	1.44
	Photo	110.5	19.2	1.42
G.	Aver.	110.0	19.0	1.41
	Photo	110.9	18.9	1.39

5 aar

6 aar


Gutter
Piker
Det samlede materiale.
De fotograferte grupper.

Height Cm.	Weight Kilos.	H.-W. Index
5 Year Olds		
105.8	18.3	1.55
105.5	17.2	1.46
102.1	17.1	1.61
102.7	18.1	1.67
102.3	16.4	1.53
101.9	17.6	1.66
102.6	16.4	1.52
103.2	17.7	1.61
6 Year Olds		
109.8	20.2	1.53
111.1	18.7	1.36
110.7	18.7	1.38
111.2	19.2	1.40
110.5	18.5	1.38

B = Boys; G = Girls.
Aver. = Average values of the whole material.
Photo = " " of the group in the photograph.

where neither the housing conditions nor nutritive provisions can be expected to be rationally provided for. But even so, the nutritive condition of the children generally was better than expected. It must be remembered, however, that conclusions of this kind may lead to an error—a rather interesting error not discovered immediately. *Children from socially better conditioned homes, of the same ages as those shown in our photographs, generally will have attained a better total development, but in so doing they also will have progressed farther in their physiological emaciation*—compare the decided lowering of the index from year to year. Hence, *the satisfactory average nutritive condition of the children recorded here is due in part to a relatively slower development than will be met in children from a better social stratum.*[10]

Thus we find that the descent of the children introduces a factor which affects their development unfavorably. But the same unfavorable factor again is responsible for a more retarded physiological emaciation. The result is that the recorded values for weight-height must not—as is the case with the averages for body height—be considered absolutely too low to serve as workable normal values; especially not when use is made of the calculated standard records for variations. Example: A remarkably low weight-height record for a 2½ year boy below 1.93,[11] or a remarkably high record above 2.33.[12] Between 1.93 and 2.33: this is no difference involving any practical difficulty.

It seems not necessary to emphasize the aforesaid error in the estimation of the children, because this error impends as soon as one attempts to judge the "nutritive conditions" without considering whether the physiological development—and with this, the physiological emaciation—occupies a primitive state in comparison with the age of the individual. An objective judgment of the somatic development must consider the previously mentioned condition of ossification together with the body height and, in later years, the signs of puberty. Pfaundler, in a paper concerning the conditions of school children, mentions that while children of the socially well-to-do generally are taller than those of the less opulent classes, this advantage is of doubtful value, because generally their weight is lower in proportion to this increased height. Our data confirm this conclusion fully. The comparatively rapid total development induces a greater average height of body together with a more rapid physiological emaciation.[13] In spite of this fact it is true that the resistance against disease is greater among the opulent. Pfaundler makes mention of a one-sidedly accelerated development in height among children of the opulent, but this cannot be accepted without some qualification. The development is a total development, and the physiological emaciation is but one feature of that. This view is further supported by the fact that menstruation generally begins at an earlier period among the opulent classes —a fact also mentioned by Pfaundler. This author does not overlook the significance of the physiological emaciation in the development of the opulent as compared with the less opulent. But he accords to it a subordinate significance: "perhaps the following . . . may contribute" (whereupon the said relation is mentioned). This "perhaps" should be changed to a *"certainly."*

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[10] Comp. Törnell's Swedish records (table 2)—a much better body height, while the weight values do not show a constant elevation.

[11] 2.13 (average) less .20 (deviation from standard), cf. tab. 4.

[12] 2.13 + .20.

When Samosch, Rietz, and others, refer to the relative circumference of the chest, and call attention to the fact that the opulent classes are less favored in this respect, the following consideration must be imposed: It is true that the relative chest circumference decreases physiologically in a line ascending with age (for boys up to the age of 13-15, whereupon an increase sets in, according to my investigations). Individuals physiologically farther developed (e.g., the average of the opulent compared with that of the less opulent), therefore, generally will demonstrate a relatively less chest circumference up to the aforesaid ages.

The relation here considered, namely, the dependence of the nutritive condition—or, rather, of the weight-height relation—upon the stage of general development, certainly must be considered an important component factor in that relation which quite empirically seems evident to everybody: that tall children, irrespective of descent and surroundings, generally are somewhat thin, while short ones are generally more rotund.

This completes the use of our statistical records of 2-6 year-olds, except for one important relation left for consideration until now. The Tables 1-4 are concerned with entire year-classes, average values and variation relations. The development in these tender years progresses, however, very rapidly (comp. the strong increase for both weight and height, the rapid falling of the weight-height index). The tables for year-classes covering these ages become rather too full of errors (owing to the variability of the material), and while recognizing these, one should not be so modest in his demands that "sufficiently exact for clinical use" should constitute one's standard of exactness.

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[13] This physiological emaciation generally is succeeded by an increase in the weight-height relation, in boys at 15½ yrs., in girls at 12½ yrs.

For this reason, the calculations should be extended to each month of these tender years. This would necessitate an enormous work with statistical calculations of averages, etc., or it would be necessary to submit the entire material to a continued investigation from month to month for a whole year. To do this is a hope for the future, when we may expect to have an organized medical supervision of all nurseries and similar institutions, which at present are largely or wholly dependent on philanthropy, and often are hard pushed economically. To the demands upon such an organized medical supervision also pertains, in my opinion, an objective and subjective control of each individual child. This is being carried out at one of the institutions furnishing material for our investigation, but in order to make use of these data they should be extended to all the material uniformly.

A greater correctness in our records may, however, be attained on the basis of what data we have. Boys between 3 and 4 years old and examined in May, 1919, had attained an average height of 92 cm. This figure characterizes best the age of 3½; for 4½ year olds we have the record of 100 cm., for 5½ 105.5 cm. These data may now be connected into a curve by the use of millimeter paper. The distance between the figures for each year-class being arranged on the abscissa so as to be easily divided by 12, the approximate values for each month (thus, 3 years 7 months; 3 years 8 months, etc.) may be easily worked out. These values—averages for practical use, for height, weight, and weight-height index—have been tabulated on Table 5. They have been carried out on the basis of the May as well as the November investigations, in order to represent better the all-year results. To determine the standard variation similarly would necessitate a continued observation during the whole year, hence cannot be developed from the material presented here. The variation given in our table refers to the year-class in closest proximity to each month of full age, hence these values represent no scientifically exact statistic calculation, but merely a practical interval which is in accord with biologial truth in so far as the data are based on the characteristics of the *closest* year-class.[14]

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[14] But not of each month. The standard variation for 2-3 yrs., for 3-4 yrs., etc., has been arranged in curves and calculated for months as above.

TABLE 5A

Averages from Investigations in May and November, 1919

Boys										
Age		Height			Weight			Weight—Height Index		
Yrs.	Months	Average Cm.		Standard Variation	Average		Standard Variation	Average		Standard Variation
2	6	86.0	4.1	81.9– 90.1	13.3	1.7	11.6–15.0	2.09	.18	1.91–2.27
	7	86.5	4.2	82.3– 90.7	13.4	...	11.7–15.1	2.07	...	1.89–2.25
	8	87.0	...	82.8– 91.2	13.6	...	11.9–15.3	2.05	...	1.87–2.23
	9	87.5	4.3	83.3– 91.8	13.7	...	12.0–15.4	2.04	...	1.86–2.22
	10	88.0	...	83.7– 92.3	13.8	...	12.1–15.5	2.02	...	1.84–2.20
	11	88.6	...	84.3– 92.9	13.9	...	12.2–15.6	2.01	...	1.83–2.19
3	0	89.1	4.4	84.7– 93.5	14.1	...	12.4–15.8	1.99	...	1.81–2.17
	1	89.7	...	85.3– 94.1	14.2	...	12.5–15.9	1.97	...	1.79–2.15
	2	90.2	4.5	85.7– 94.7	14.3	...	12.6–16.0	1.96	...	1.78–2.14
	3	90.7	...	86.2– 95.2	14.4	1.6	12.8–16.0	1.94	...	1.76–2.12
	4	91.2	...	86.7– 95.7	14.6	...	13.0–16.2	1.92	...	1.74–2.10
	5	91.7	4.6	87.1– 96.3	14.7	...	13.1–16.3	1.91	...	1.73–2.09
	6	92.2	...	87.6– 96.8	14.8	...	13.2–16.4	1.89	...	1.71–2.07
	7	92.8	4.7	88.1– 97.5	14.9	...	13.3–16.5	1.87	...	1.69–2.05
	8	93.5	...	88.8– 98.2	15.1	...	13.5–16.7	1.85	...	1.67–2.03
	9	94.1	...	89.4– 98.8	15.2	1.7	13.5–16.9	1.84	...	1.66–2.02
	10	94.7	4.8	89.9– 99.5	15.4	...	13.7–17.1	1.82	...	1.64–2.00
	11	95.3	...	90.5–100.1	15.5	...	13.8–17.2	1.80	...	1.62–1.98
4	0	95.9	4.9	91.0–100.8	15.7	...	14.0–17.4	1.78	...	1.60–1.96
	1	96.5	...	96.1–101.4	15.8	...	14.1–17.5	1.77	...	1.59–1.95
	2	97.1	...	92.2–102.0	16.0	...	14.3–17.7	1.76	...	1.57–1.93
	3	97.8	5.0	92.8–102.8	16.1	...	14.4–17.8	1.73	...	1.55–1.91
	4	98.4	...	93.4–103.4	16.3	...	14.6–18.0	1.72	...	1.54–1.90
	5	99.0	...	94.0–104.0	16.4	...	14.7–18.1	1.70	...	1.52–1.88
	6	99.7	5.1	94.6–104.8	16.6	...	14.9–18.3	1.68	...	1.50–1.86
	7	100.1	...	95.0–105.2	16.7	...	15.0–18.4	1.67	...	1.49–1.85
	8	100.6	...	95.5–105.7	16.8	...	15.1–18.5	1.66	...	1.48–1.84
	9	101.0	5.0	96.0–106.0	16.9	...	15.2–18.6	1.65	.17	1.48–1.82
	10	101.5	...	96.5–106.5	17.0	...	15.3–18.7	1.64	...	1.47–1.81
	11	101.9	...	96.9–106.9	17.1	...	15.4–18.8	1.63	...	1.46–1.80
5	0	102.4	...	97.4–107.4	17.3	...	15.6–18.9	1.62	...	1.45–1.79
	1	102.8	...	97.8–107.8	17.4	...	15.7–19.1	1.61	.16	1.45–1.77
	2	103.3	...	98.3–108.3	17.5	...	15.8–19.2	1.59	...	1.43–1.75
	3	103.7	4.9	98.8–108.6	17.6	...	15.9–19.3	1.58	...	1.42–1.74
	4	104.2	...	99.3–109.1	17.7	...	16.0–19.4	1.57	...	1.41–1.73
	5	104.6	...	99.7–109.5	17.8	...	16.1–19.5	1.56	.15	1.41–1.73
	6	105.1	...	100.2–110.0	17.9	...	16.2–19.6	1.55	...	1.40–1.70
	7	105.5	...	100.6–110.4	18.0	1.8	16.2–19.8	1.54	...	1.39–1.69
	8	106.0	...	101.9–110.9	18.1	...	16.3–19.9	1.53	...	1.38–1.68
	9	106.4	...	101.5–111.3	18.3	...	16.5–20.1	1.52	...	1.37–1.67
	10	106.9	...	102.0–111.8	18.4	...	16.6–20.2	1.52	...	1.37–1.67
	11	107.3	...	102.4–112.2	18.5	...	16.7–20.3	1.51	...	1.36–1.66
6	0	107.8	...	102.9–112.7	18.6	1.9	16.7–20.5	1.50	...	1.35–1.65
	1	108.3	...	103.4–113.2	18.8	...	16.9–20.7	1.49	.14	1.35–1.63
	2	108.7	4.8	103.9–113.5	18.9	...	17.0–20.8	1.48	...	1.34–1.62
	3	109.2	...	104.4–114.0	19.0	...	17.1–20.9	1.47	...	1.33–1.61
	4	109.6	...	104.8–114.4	19.1	...	17.2–21.1	1.47	...	1.33–1.61
	5	110.1	...	105.3–114.9	19.3	2.0	17.3–21.3	1.46	...	1.32–1.60
	6	110.6	...	105.8–115.4	19.4	...	17.4–21.4	1.45	...	1.31–1.59

TABLE 5B

AVERAGES FROM INVESTIGATIONS IN MAY AND NOVEMBER, 1919

Girls										
Age		Height			Weight			Weight—Height Index		
Yrs.	Months	Average		Standard Variation	Average		Standard Variation	Average		Standard Variation
2	6	85.2	5.1	80.1– 90.3	12.7	1.9	10.8–14.6	2.07	.20	1.87–2.27
	7	85.8	...	80.7– 90.9	12.8	...	10.9–14.7	2.05	...	1.85–2.25
	8	86.4	...	81.3– 91.5	13.0	...	11.1–14.9	2.03	...	1.83–2.23
	9	87.0	...	81.9– 92.1	13.1	...	11.2–15.0	2.01	...	1.81–2.21
	10	87.6	...	82.5– 92.7	13.2	1.8	11.4–15.0	1.98	...	1.78–2.18
	11	88.1	...	83.0– 93.2	13.4	...	11.6–15.2	1.96	...	1.76–2.16
3	0	88.7	...	83.6– 93.8	13.5	...	11.7–15.3	1.94	...	1.74–2.14
	1	89.3	...	84.2– 94.4	13.7	...	11.9–15.5	1.92	.19	1.73–2.11
	2	89.9	5.2	84.7– 95.1	13.8	...	12.0–15.6	1.90	...	1.71–2.09
	3	90.5	...	85.3– 95.7	14.0	...	12.2–15.8	1.88	...	1.69–2.07
	4	91.1	...	85.9– 96.3	14.1	1.7	12.4–15.8	1.86	...	1.67–2.05
	5	91.7	...	86.5– 96.9	14.3	...	12.6–16.0	1.83	...	1.64–2.02
	6	92.2	...	87.0– 97.4	14.4	...	12.7–16.1	1.81	...	1.62–2.00
	7	92.7	...	87.5– 97.9	14.5	...	12.8–16.2	1.81	...	1.62–2.00
	8	93.2	...	88.0– 98.4	14.6	1.8	12.8–16.4	1.80	...	1.61–1.99
	9	93.7	5.1	88.6– 98.8	14.7	...	12.9–16.5	1.79	.18	1.61–1.97
	10	94.2	...	89.1– 99.3	14.9	...	13.1–16.7	1.78	...	1.60–1.96
	11	94.6	...	89.5– 99.7	15.0	...	13.2–16.8	1.76	...	1.58–1.94
4	0	95.1	...	90.0–100.2	15.1	1.9	13.2–17.0	1.75	...	1.57–1.93
	1	95.6	...	90.5–100.7	15.2	...	13.3–17.1	1.74	...	1.56–1.92
	2	96.1	...	91.0–101.2	15.3	...	13.4–17.2	1.73	...	1.55–1.91
	3	96.5	5.0	91.5–101.5	15.5	...	13.6–17.4	1.72	...	1.54–1.90
	4	97.0	...	92.0–102.0	15.6	...	13.7–17.5	1.71	.17	1.54–1.88
	5	97.5	...	92.5–102.5	15.7	2.0	13.7–17.7	1.70	...	1.53–1.87
	6	98.0	...	93.0–103.0	15.8	...	13.8–17.8	1.68	...	1.51–1.85
	7	98.5	...	93.5–103.5	15.9	...	13.9–17.9	1.67	...	1.50–1.84
	8	99.0	...	94.0–104.0	16.1	...	14.1–18.1	1.66	...	1.49–1.83
	9	99.5	4.9	94.5–104.4	16.3	...	14.3–18.3	1.65	...	1.48–1.82
	10	100.0	...	95.1–104.9	16.4	...	14.4–18.4	1.64	...	1.47–1.81
	11	100.5	...	95.6–105.4	16.6	...	14.6–18.6	1.63	...	1.46–1.80
5	0	101.0	...	96.1–105.9	16.7	...	14.7–18.7	1.62	...	1.45–1.79
	1	101.4	...	96.5–106.3	16.9	...	14.9–18.9	1.61	...	1.44–1.78
	2	101.9	...	97.0–106.8	17.0	...	15.0–19.0	1.60	...	1.43–1.77
	3	102.4	...	97.5–107.3	17.2	...	15.2–19.2	1.59	...	1.42–1.76
	4	102.9	4.8	98.1–107.7	17.3	...	15.3–19.3	1.59	...	1.42–1.76
	5	103.4	...	98.6–108.2	17.4	...	15.4–19.4	1.58	...	1.41–1.75
	6	103.9	...	99.1–108.7	17.6	...	15.6–19.6	1.57	...	1.40–1.74
	7	104.4	...	99.6–109.2	17.7	...	15.7–19.7	1.56	...	1.39–1.73
	8	105.0	...	100.2–109.8	17.9	...	15.9–19.9	1.54	...	1.37–1.71
	9	105.5	...	100.7–110.3	18.0	...	16.0–20.0	1.53	.16	1.37–1.69
	10	106.0	...	101.2–110.8	18.1	...	16.1–20.1	1.52	...	1.36–1.68
	11	106.6	4.7	101.9–111.3	18.3	...	16.3–20.3	1.51	...	1.35–1.67
6	0	107.0	...	102.4–111.8	18.4	...	16.4–20.4	1.49	...	1.33–1.65
	1	107.6	...	102.9–112.3	18.5	...	16.5–20.5	1.48	.15	1.33–1.63
	2	108.2	...	103.5–112.9	18.7	2.1	16.6–20.8	1.47	...	1.32–1.62
	3	108.7	...	104.0–113.4	18.8	...	16.7–20.9	1.46	...	1.31–1.61
	4	109.2	...	104.5–113.9	19.0	...	16.9–21.1	1.44	...	1.29–1.59
	5	109.7	...	105.0–114.4	19.1	...	17.0–21.2	1.43	.14	1.29–1.57
	6	110.3	...	105.6–115.0	19.2	...	17.1–21.3	1.42	...	1.28–1.56

This is true especially for the weight-height index where the variation within the given years is very considerable, and the variation, or difference, between the individuals mutually grows less and less (2 year olds have a stand.-var. of .18 decreasing to .14 in 6 year olds, for boys; girls, .20 decreasing to .14). Yet this practical interval becomes fairly spacious; values above or below the limits show considerable variation from the standards. This is of interest in so far as only variations of some size possess any clinical interest. On the other hand, the limits are neither arbitrary nor by any means unduly spacious.[15] As a matter of course, it is only the nearest half-year surrounding each month whose individual variation[16] determines the limits. For a practical estimation of individuals this method—averages for the months, with the variation of the year classes—is far better than yearly averages and variations.

NOTE.—The weight-height index is a very good objective scale for the weight-height relation. But we cannot demand of the practitioner—even if he is a specialist in pediatrics—that he must carry out investigations requiring even the use of logarithmic tables, even though they require but a few minutes of his time. We therefore have begun the compilation of index-tables from which the weight-height relation may be read directly when height and age are given.

We now proceed to an application of the statistical results and the table developed from them by

B. *A selection of the poorly "nourished" individuals and especially of the small individuals within the year-classes* for special study, nutrition, or medical care.

After the inspection of the figures for each child for height and for weight-height index,[17] and after the comparison has been made, the Child Hygiene Office has called in for special treatment those individuals which fell below the standards for their age, for weight-height index or for body height. These cases were submitted to special investigation and, wherever necessity demanded, recommended to the local officials for special nutritive care, or referred for medical, or hospital treatment. Such children may be thin, weakly, or pale, without definite symptoms of illness; again, they may be pronounced rachitics, or they may exemplify myxedematous types, reduced in growth, apathetic, or otherwise peculiar or suspicious.

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[15] Thus it will be seen that Törnell's averages for height, in numerous year-classes, correspond fairly well to our highest limits, or even exceed these.

[16] Expressed by the standard-variation.

[17] Each child has its printed blank, which is annotated at the time of the examination.

We have made mention of the selection of especially small children and of children with a notably small weight-height relation in proportion to age. This does not absolutely imply that either the averagely well developed, the tall ones, or those exhibiting a great weight-height figure are always to be considered satisfactory in their development. It only means that these signs of greater variation from normal, taken by themselves, call for a searching investigation.

It now is our desire to repeat our studies at the same institutions at half-year intervals. The second series—November, 1919—conducted after the first half year, already has been finished. In this manner will

C. *The individual children who frequent nurseries and children's homes, etc., be followed up and subjected to a continued control,* because a steady stream of material derived from the same social group always will yield data which permit of an objective basis of comparison. Special attention will be given to *children who remain stationary in weight, or whose weight is decreasing.*[18] Puyg y Roig lately published a series of studies from Barcelona: Monthly records from January to October showed 5% of children between 4 and 9 years were losing weight. This remarkable result also was attained, that girls were more exposed to such a loss in weight than boys; and the author quotes percentages with loss of weight for each year-class, this percentage descending with advancing years (5.2% for 4 year olds to .03 at age of 9; the values for girls vary greatly: 23.5% at 4 years, 9.8% at 6, 15% at 9 years). If we work out the averages for the year-classes, we find that the average is 2.7 in boys with loss of weight, 12.4 in girls. These facts are very remarkable, but we can draw no conclusion until a corresponding investigation has been made of the children of both sexes under our observation.

To follow up and establish a control of each individual child at definite intervals really is the most important desideratum for hygienic purposes, not only in regard to the institutions but also for the children themselves. It will stimulate the interest in, and the care of, the little ones.

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[18] Here we shall make use of the absolute weight values, because they concern the same individual at different periods.

Concluding remark: A subjective estimation of development and nutritive results *may,* as I have pointed out elsewhere,[19] be good, but in itself it contains no guarantee of its value for others; again, it may be exceedingly poor, and especially so in these tender years where the weight-height relation changes from month to month, and where, if one would be particularly exact, it is necessary to consider also the sexual differences. *To a good investigation belongs both an objective control and a subjective estimate.*

APPENDIX

A View of the Weight-Height Relation During the Ages 0-17 *Years*

The opinion that the ponderal development of the body follows a wave-line has been strongly emphasized by Stratz and was credited by him to Bartels. It means that the " Periode der Streckung " would alternate with the " Periode der Fülle." This opinion almost has become a dogma and as such is repeated in some of the large text-books, such as Martin's " Lehrbuch d. Anthropologie," and Broman " Normale und Abnormale Entwickelung der Menschen." Spitzy, however, opposes this opinion, following the example of Weissenberg and adducing his records by way of proof. We ourselves cannot support Weissenberg in his establishment of seven periods. W. did not employ reliable methods in his study of the weight-height relation; furthermore, the energy of growth in height has been recorded by him in cms. and not as a coefficient of growth. The divisions established by Stratz are the following:

The first neutral period.

0—1 year: Infancy

2, 3, 4 years: Greatest ponderal development.
(" Fülle ")

5, 6, 7 years: Greatest height development.

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[19] *Medicinale Revue,* 1919, Nov. and Dec.

The second, or bi-sexual age period.

Year	*Boys*	*Year*	*Girls*
8 9 10 11 12	Second period of ponderal development (" Fülle ")	8 9 10	Second period of Pond. devel. (Rounding of hips and legs.)
13 14 15 16	Second period of height development. (Change of voice.)	11 12 13 14	Second period of height development. Menstruation. Areola-Mamma Mamma areolata
17	Third pond. devel. (" Fülle ")	15	Third per. of Pond. devel. (" Fülle ")
18	Puberty.	16 17 18	Puberty

If we consider such a scheme as this in the light of a dogma, it will be a comparatively easy matter to find some children which fit into it. The artistic photographs of Stratz seem to go very naturally with the divisions in the scheme. But a subjective selection, such as his, very often is based on misapprehension and leads to nothing but wrong conclusions. It is urgently necessary, with such a scheme, and in order to test its truth or its availability, to carry one's demands of objectively selected examples (individuals) to its uttermost consequence. Our photographs attempt to accomplish this. As aforesaid, groups were selected, the individuals having been picked out without immediate inspection by the author,[20] the selection being based only upon the records. These groups of course must be as large as possible. A limited material limits the presence of types sufficiently close to the averages. Each child is designated by number. The group scheme makes it possible to attain a general view. A couple of rachitic children went in along with the rest. The collective material of course ought to have been vast. But an objective view of the development from year to year—our principal purpose—was possible by our method. Any sudden height increase, a definite year standing out as a separate or peculiar period, does not occur. When the said dogma—the conspectus or scheme of Stratz—has been able to obtrude itself in the literature of our subject, this is due only to mankind's immodest and absurd tendency to propose laws, to build up schematic structures and afterwards fill out the vacant spaces with suitable brickwork. If the dogmas on this subject—as on others—have found many adherents, this is due only to the comparative ease with which the masses are led. Meanwhile we admit that if one, in a subjective way and without critique, proceeds to follow up the development of individual children—e.g., one's own—he may receive an impression of certain "periods" of intensive growth in height. And such periods really do exist—but they follow the yearly seasons: there is a strong and fairly exclusive height-increase during the summer months of May, June and July. This, however, is a quite different matter; different from an alternation of height-increase and increase of ponderability. *Throughout the year-classes runs an uninterrupted height-increase from the period of infancy up to the intensive growth in height at the time of pre-puberty.* This may be demonstrated objectively by the continued decrease in these years of the weight-height relation. In all probability the relative chest circumference will demonstrate the same result. I conclude from the very limited amount of data on chest circumference taken from two series, 6 years to 14 and 12-17, including my own records, that such is the case.

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[20] Who was not even present when the photographs were taken.

The weight-height relation decreases rapidly during the first years, especially up to the fourth, where it becomes more slowly descending.[21] After 15 (weight-height index 1.14) the weight-height relation is rising. The curve for girls shows—corresponding to the relatively rapid development of this sex—a falling off only as far as year 12 (when the index is 1.14, exactly the same as in boys of 15); then it begins to rise (cf. Fig. 2, the curve). The process of physiological emaciations—or, if one prefers an objective term, the decreasing weight-height relation—is succeeded by a rise first at that year which represents the strongest growth in height; the pre-puberty period, 12 in girls, 15 in boys. Here the body, in ample time before the transition into puberty, begins an increase in weight relatively, in proportion to its height. The Bartels-Stratz dogmas hence deserve no further consideration.

The curves show that the weight-height relation for girls is less at all ages between 2 and 12, excepting years 4 and 5; see above. The curves cross each other at age 13.

It is true that ponderability of body is not identical with the weight-height relation. Yet a wave movement in the values of ponderability, such as is mentioned above, might be expected to show itself in the curve demonstrating the

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[21] Stratz, et al., maintain a special period of emaciation *after* fourth year.

TABLE 6

Boys

Age Yrs.	Kristiania May & Nov. 1919	Kristiania 1917	Kristiania 1918	Stavanger 1918	Denmark ....
2	2.09	....	....	....	....
3	1.89	....	....	....	....
4	1.68	....	....	....	....
5	1.55	....	....	....	....
6	1.45	....	....	....	1.42
7	....	....	....	1.33	1.37
8	....	1.30	....	1.27	1.30
9	....	1.24	....	1.26	1.28
10	....	1.19	....	1.20	1.25
11	....	1.19	....	1.19	1.22
12	....	1.14	1.16	1.16	1.20
13	....	1.13	1.15	1.11	1.19
14	....	....	1.15	1.13	1.19
15	....	....	1.14	....	....
16	....	....	1.15	....	....
17	....	....	1.19	....	....

Girls

Age Yrs.	Kristiania 1919	Kristiania 1917	Kristiania 1918	Stavanger 1918	Denmark	AVERAGES Boys	Girls
2	2.07	....	....	....	....	2.09	2.07
3	1.82	....	....	....	....	1.89	1.82
4	1.68	....	....	....	....	1.68	1.68
5	1.57	....	....	....	....	1.55	1.57
6	1.42	....	....	....	1.42	1.44	1.42
7	....	....	....	1.30	1.33	1.35	1.32
8	....	1.29	....	1.27	1.28	1.29	1.28
9	....	1.23	....	1.22	1.25	1.26	1.23
10	....	1.17	....	1.20	1.22	1.21	1.20
11	....	1.14	....	1.17	1.20	1.20	1.17
12	....	1.10	1.11	1.15	1.20	1.17	1.14
13	....	1.10	1.13	1.16	1.19	1.15	1.15
14	....	....	1.15	1.17	1.23	1.16	1.18
15	....	....	1.18	....	....	1.14	1.18
16	....	....	1.22	....	....	1.15	1.19
17	....	....	1.27	....	....	1.19	1.27

weight-height relation through the years. Table 6 shows the data of studies along this line; "Kristiania 1919" includes the ages 2-6, the material upon which this paper is based. "Kristiania 1917" includes the ages 8-13: Studies based upon averages worked out from a mass of material (10,000 children from the Northern counties, 1913-14). "Stavanger 1918" is the result of school records taken at the initiative of the local statistical office. "Denmark" summarizes the records of 1000 children whose records were published in the Tidsskrift for dansk Skolehygiejne 1919, nr. 8. It will be observed that the results are closely related, hence the averages will obscure incidental aberrations. Fig. 2 (the curve) was constructed from these averages.

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BOOK REVIEW

La Philosophie Géométrique de Henri Poincaré. By Louis Rougier.

This is a resumé and amplification of Poincaré's views on the nature of mathematics, as exemplified by that branch of mathematics that seems, perhaps, most contradictory to these views, namely, geometry.

The dominant thesis of the monograph may be stated thus: The results of any mathematical investigation are derived by logistic methods from certain "first notions" and "first propositions," which have no meaning in themselves but are capable of various interpretation; and to each possible interpretation of the "first notions and propositions" corresponds an interpretation of the results, which are then necessarily true.

The "first propositions" are not really propositions, they are rather "propositional functions." A proposition is a statement that is either true or false, whereas the "first propositions" are mere "forms," and it would be absurd to speak of them as either true or false. We may choose these "first notions and propositions" as we please; the only condition to which they are subject is that they shall be consistent and sufficient for the purpose of the investigation. In geometry they have been suggested by our experience. But we now know that a consistent geometry can be constructed without Euclid's axiom (on which the theory of parallels is based) and even without the postulate of three dimensions.

Any consistent geometry is either Euclidean, Riemannian, or Lobatchevskian, and either of these geometries is applicable to any space; so that geometry gives us no information about the nature or structure of space. We usually employ the Euclidean geometry, because it is the simplest, but we may equally well employ either of the other kinds of geometry in any problem relating even to what we call 'our' space. We have adopted the point as the fundamental element of space and, therefore, our space has three dimensions; we might have adopted the straight line as element and then our space would have four dimensions; the adoption of other possible fundamental elements would have given five, six, or even more dimensions to our space.

One form of experience that has lead us to adopt the Euclidean geometry is the conception of a body moving without deformation, that is, without any change in the mutual distances of its points. But this conception must be based upon some definite system of measurement. Either of the three possible kinds of geometry is a system of measurement, and what would be no deformation of a moving body when referred to one system of measurement would be a deformation when referred to another system. Thus, the contraction that a moving body undergoes in the direction of the motion, according to the Einstein theory, when referred to a Euclidean system of measurement would be no deformation when referred to a certain Lobatchevskian system.

Moreover, to any kind of geometry belongs a peculiar system of the "first notions" that we call 'straight lines,' 'planes,' etc. According to the Einstein theory, the lines in which light moves are not straight (when referred to the Euclidean geometry), but they would be straight when referred to a certain Lobatchevskian geometry.

The monograph contains a very interesting and very complete sketch and criticism of the various systems of assumptions on which geometry has been based by those who have attempted to systematize the subject or make it more definite.

It would be impossible to go more into detail in a review of this monograph without employing mathematical language that would be unintelligible to the general reader. In fact, most of the monograph will be unintelligible to a reader who is not familiar with several branches of the higher mathematics. Thus, what we call 'motion' is a system of continuous linear transformations that form a 'group,' and any system of measurement (system of geometry) is based on such a system of linear transformations that leave certain forms invariant.

WILLIAM E. STORY.

BOOK NOTES

A General Outline and Syllabus on Hygiene. By T. A. Storey. Wash., Govt. Printing Office, 1920. 114 p.

It is impossible to characterize this outline in the space at our disposal. Suffice it to say that the author's name itself is sufficient guarantee of its quality. First come group and intergroup hygiene, and then general and individual hygiene. The bibliography is copious and well chosen. Part Second touches upon venereal and other special diseases—also divided into individual and group, and with extensive bibliographies. Part III is on special group and intergroup hygiene, e. g. social, school, occupational, etc.

The Principles of Education. By Jesse H. Coursault. Boston, Silver, Burdett and Co., 1920. 468 p.

During the last decades of the nineteenth century psychology dominated the theory of education, but lately experimental science has been the dominant method. The scientific attitude toward education has substituted facts for opinions. The writer has been working for twelve years in the classroom and cites Hanus, Münsterberg, Royce, Dewey, McMurry, Thorndike, Gordy, Thilly and others as vouchers for his competency. He divides his material into The Individual, The Social, and The Educational Process. The writer is very conscious of his method and takes needless time to point out the obvious and withal attempts to be fundamental in a very profound sense. The very subject of his book indicates a certain degree of boldness and self-confidence which at once challenges attention, but the thoughtful student of education is liable to suffer serious disappointment if he attempts to read the book.

Ueber die Fernald'sche Methode zur Prüfung des sittlichen Fühlens und über ihre weitere Ausgestaltung. By L. Jacobsohn-Lask. Leipzig, J. Barth, 1920. 84 p.

Methodensammlung zur Intelligenzprüfung von Kindern und Jugendlichen. By W. Stern and O. Wiegmann. Leipzig, Barth, 1920. 256 p.

Untersuchungen über die Intelligenz von Kindern und Jugendlichen. By W. Minkus, W. Stern, H. P. Roloff, G. and A. Schober, A. Penkert. Leipzig, Barth, 1919. 167 p.

Die Auslese befähigter Volksschüler in Hamburg. By Rudolf Peter and William Stern. Leipzig, Barth, 1919. 157 p.

Die Intelligenz der Kinder und Jugendlichen. By William Stern. Leipzig, Barth, 1920. 335 p.

In the above five books (the first four being *Beihefte* of the *Zeitschrift für angewandte Psychologie*) we have at last a pretty exhaustive account of the methods and results of Stern and his pupils. The tests they have developed are very different from those of the Binet-Simon school, which were the starting point of all such work in America, and a comparison of the two cannot fail to show any candid mind that each of these groups of workers has much to teach the other. In the last of the above volumes Stern sums up the methods and conclusions of his school, so that in the pamphlets and book together we have now for the first time a comprehensive survey of what may be called the Stern school of child study and testing. It would be a godsend to American students in this field, of whom there are so many, if the last volume could be translated or, perhaps better yet, a new compilation made of the material set forth in all the above.

Dr. Klages' Entwurf einer Charakterkunde. By OSKAR HERMANN. Leipzig, J. Barth, 1920. 63 p.

Klages' outline of characterology is here presented in popular form for educators and hygienists and is of much interest and suggestiveness. We are given a kind of natural history of character, with certain hints as to its relations to occupation. For the measurement of temperature, affectivity, and will we are given equations. All the tabulations are suggestive, especially that of the general structure of character and what it is made of, motivation, energy, etc.

Transformons L'École. By AD. FERRIERE. Geneva, Bureau International des Ecoles Nouvelles, 1920. 149 p.

The author of this interesting and significant brochure is impressed with the great contrast in Switzerland between the requirements of child study and the actual practices of the school. In this work he sets forth the points of disparity and suggests how the *rapprochement* between the two can be best effected. His conceptions of what is desirable evidently borrow very much from Montessori, but he sanely and wisely holds to the cardinal principle that the nature and needs of the child are everywhere normative.

French Contemporary Psychology. By GEORGES DWELSHAUVERS. Paris, F. Alcan, 1920. 256 p.

This volume epitomizes recent tendencies in French psychology, stressing most of all Bergson and Ribot, and attempts to show that there is a certain unity between even the idealistic and scientific trends in this field and that for this reason, and because of its general excellence, the state of psychology in France is at present far superior to that of Germany.

The Psychology of Functional Neuroses. By H. L. HOLLINGWORTH. N. Y., D. Appleton and Co., 1920. 259 p.

The author represented psychology in the U. S. A. General Hospital at the Plattsburg Barracks, N. Y., and saw in all nearly 1,200 cases, most of which were examined, some merely enough to test mental age while several hours each were spent on other cases. Midway in the author's stay came the armistice, the effects of which were full of psychological interest. No attempt seems to have been made to analyze intensively any case, but general ideas of this group of cases were chiefly kept in mind. There are almost no references to the really copious recent literature on the subjects here treated. Perhaps the author's most interesting results are those derived from his 116 questions which he asked his patients to answer. He takes an essentially negative attitude toward Freudianism. Desirable as it is that the psychological standpoint should be exploited to the very uttermost in the study of psycho-neurotic cases, it is very essential that the author should have no psychological bias or at least should not display it.

Nursery School Education. Ed. by GRACE OWEN. N. Y., E. P. Dutton and Co., 1920. 176 p.

The authors approach the topic from special standpoints—psychology, hygiene, etc. The six chapters are written by as many different experts who have dealt with their subject in as many different ways. This sometimes rather wide-ranging individuality gives the book all the greater human interest and will make it more effective. It should be in the hands of all interested in the subject.

Evening Play Centres for Children. By JANET P. TREVELYAN. N. Y., E. P. Dutton and Co., 1920. 177 p.

This book tells us of the origin of the movement, the first play school center, the struggle with finance, the London centers after the grant, the movement in the provinces, vacation schools, and organized playgrounds. The volume is illustrated by a number of photographs showing the activities of children in these centers.

Laboratory Projects in Physics. By FREDERICK F. GOOD. N. Y., The MacMillan Co., 1920. 267 p.

These experiments have been organized with the purpose of giving concrete expression in the field of physics to the recent tendencies in the teaching of science with respect to aim, subject matter, and method. Units of study should be such as high school boys and girls can easily take in and should stress the organization of practical situations. The work is copiously illustrated. The laboratory references are well selected and, best of all, there is not too much mathematics.

The Socialized Recitation. By CHARLES L. ROBBINS. Boston, Allyn and Bacon, 1920. 100 p.

The chief topics treated in this volume include the weakness of the individual recitation, how to organize the socialized recitation and what it tries to accomplish, dangers to avoid, qualities to develop, the problems of the teacher, and illustrative lessons.

Short Plays. By Representative Authors. Ed. by ALICE M. SMITH. N. Y., The MacMillan Co., 1920. 318 p.

Twelve plays are here brought together to illustrate different dramatic schools and methods and which are also believed to have some moral value.

The Boise Survey. By J. B. SEARS. Yonkers, World Book Co., 1920. 290 p.

This survey is a pretty complete study of the administration of a school system in a city of about 35,000 people, and it should appeal especially to those interested in education in cities of approximately that size. The survey covers problem, organization, staff, curriculum, efficiency, progress, individual differences, health, buildings and grounds, the high school, vocational guidance, etc. It is well written and well printed.

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